approach

FEBRUA THE NAVAL AVIATION SAFETY REVIEW

V.14 #8

tra
inc
Th
fo
Ur
ha

ai
we
an
ur
u
ma
th
wh
va
be
of
co
in

th

Aerial Combat MANEUVERS

AS A RESULT of combat operations in Vietnam, training in ACM (air combat maneuvering) has received increased emphasis in naval aviation during recent years. This development has provided increased opportunities for many pilots to engage in practice "hassling." Unfortunately, it also provides a potential for increased hazards to both pilots and aircraft.

Midair collisions are one potential hazard. Whenever aircraft operate in close proximity, as in formation work, there must be a high degree of coordination among all pilots concerned. However, it ought to be understood that ordinary formation practice – or the understanding of ordinary formation maneuvering – does not necessarily prepare a pilot for the more stringent demands of air combat maneuvering where angles of approach and closing speeds may be vastly different. This means that all practice ACM must be predicated on a complete understanding of the rules of engagement by all participants, and must take into consideration the ability and experience of pilots involved.

During practice ACM aircraft are often flown close to the limits of their flight envelopes. This means that in the normal course of events, a pilot will occasionally exceed those limits. When that occurs, likely as not, the aircraft enters uncontrolled flight and recovery techniques become critical. Of course, the inadvertent stall/spin is not the only hazard associated with ACM but in today's high performance aircraft it is a very real hazard as illustrated by the following accident brief:

Inadvertent Stall/Spin

A flight of two F-4Bs briefed for a flight which would entail practice intercepts under their own control, air combat maneuvering and a bingo to a target for practice bombing. Since ACM was included, the flight leader briefed on flight limitations, base altitudes, post-stall gyrations and spin recovery techniques. The area chosen for intercepts was over a valley and altitudes of 12 and 14,000 feet were assigned for fighter and bogey, respectively.

After takeoff, Red Flight as we will call it, split up with one aircraft climbing to 12,000 ft and the other to 14,000 ft. After one intercept and reattack each, the air combat maneuvering portion of the flight was commenced with Red One as the attacker. The ground

rules for the engagement as prebriefed by the flight leader were that the defender could use afterburner as desired during the attack but the attacker could not; the engagement would be broken off if the advantage switched, a stalemate occurred or 5,000 ft altitude was reached.

The aircraft were configured with a full centerline tank, MER s shifted forward on stations 1 and 9 with two Mk-88 water filled practice bombs weighing 450 lbs each on each MER. Fuel weight at this time was about 11,000 lbs.

Red One began a rear quarter run which was countered by Red Two with a hard starboard turn, an ease off to gain separation, then a hard climbing turn. After a series of turns and reversals, Red Two began a separation run at 10,000 ft, accelerated to 450 kcas, extended speed brakes, reduced power to IDLE and began a hard 60-70 degree banked reversal. As the airspeed bled off rapidly to 350 kcas, he reapplied military power and retracted the speed brakes while continuing the turn, whereupon the controls became less responsive, the aircraft entered an accelerated stall and departed from controlled flight. The pilot neutralized the controls and the aircraft stabilized in a steep nose down, right wing down attitude.

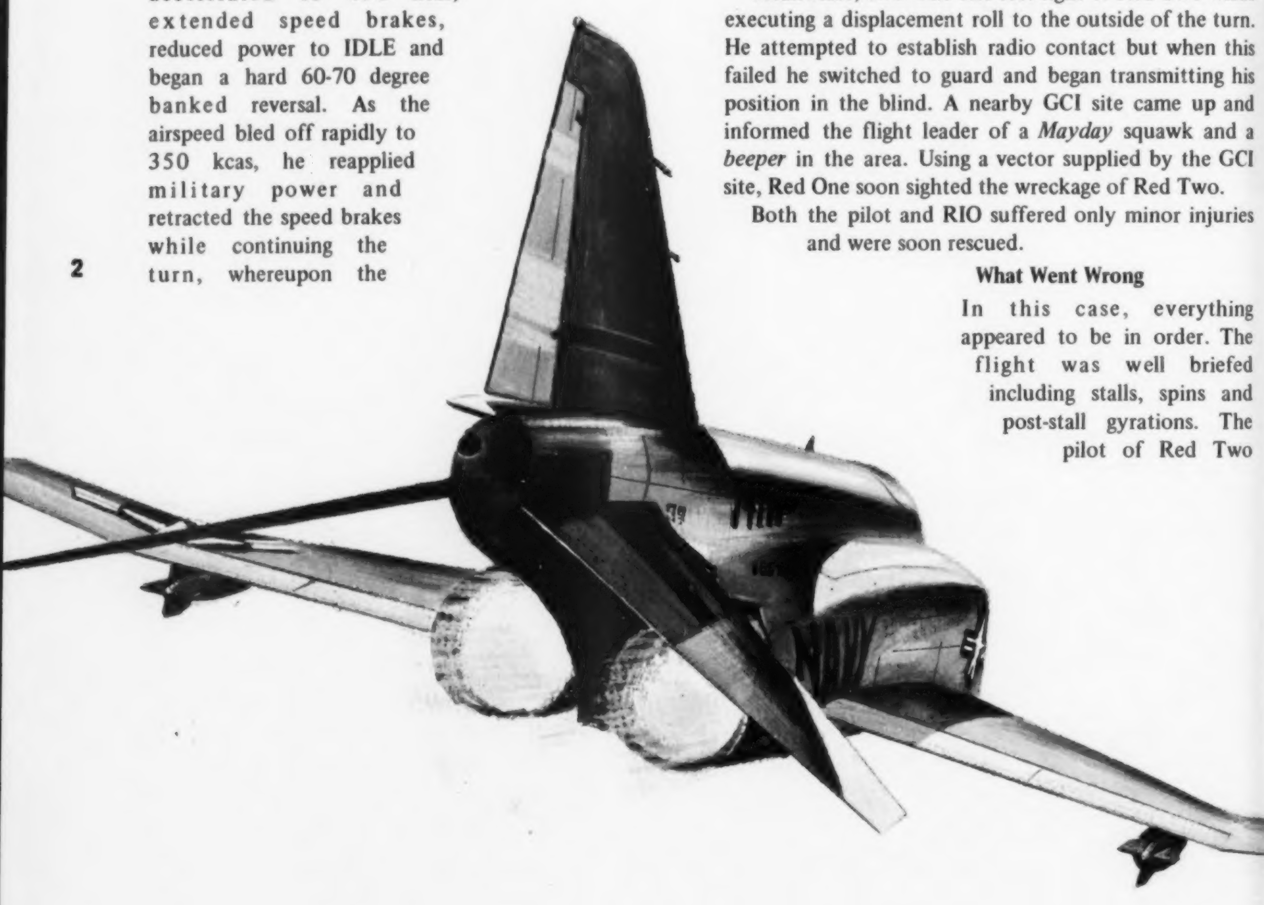
With a broken cloud deck approaching (and the RIO calling, "Pull up! Pull up!"), the pilot of Red Two, while passing 8000 ft, attempted to level the wings with left stick while beginning his pull out. The aircraft stalled again and snaprolled to the right, entering the clouds inverted. The pilot called "Get out!" three times on the ICS and then ejected utilizing the alternate firing handle. The RIO did not understand the transmission – at first – until he saw the front seat leave the aircraft. He then attempted to eject with the alternate handle but unable to pull it, he reached immediately for the face curtain and ejected himself.

Meanwhile, Red One had lost sight of Red Two while executing a displacement roll to the outside of the turn. He attempted to establish radio contact but when this failed he switched to guard and began transmitting his position in the blind. A nearby GCI site came up and informed the flight leader of a *Mayday* squawk and a *beeper* in the area. Using a vector supplied by the GCI site, Red One soon sighted the wreckage of Red Two.

Both the pilot and RIO suffered only minor injuries and were soon rescued.

What Went Wrong

In this case, everything appeared to be in order. The flight was well briefed including stalls, spins and post-stall gyrations. The pilot of Red Two



had previously viewed the F-4 spin test movie, had received comprehensive lectures on F-4 spin characteristics while undergoing RCVW training and was familiar with the F-4 NATOPS discussion of spins . . . but he had never before actually spun a swept-wing jet. One endorsing officer concluded that thorough as his training had been, it had not provided him with the ability to "feel" the impending situation.

Spin Training Recommendation Pending

As a result of this and other similar accidents, it has been recommended that actual spin training in jet aircraft be provided in both the Advanced Training Command and in RCVW squadrons. Approval and implementation of this recommendation involves many complex considerations and as of now the recommendation is pending.

The Judgment Factor

A good fighter pilot will have many distinguishing traits but none are more likely to be evident than aggressiveness and pride. But, important as these traits are, neither is as important as good judgment – the factor which allows the fighter pilot to weigh all considerations and arrive at an optimum course of action.

It has been argued that since many actual engagements will take place against the enemy at low altitudes, some air combat maneuvering training should be practiced at low altitude in order to be realistic. This is a good point but, obviously, there are limits as to how realistic one can be in a training situation. This is the reason we do not routinely *practice* actual ejection from aircraft or fire live ammunition during practice ACM.

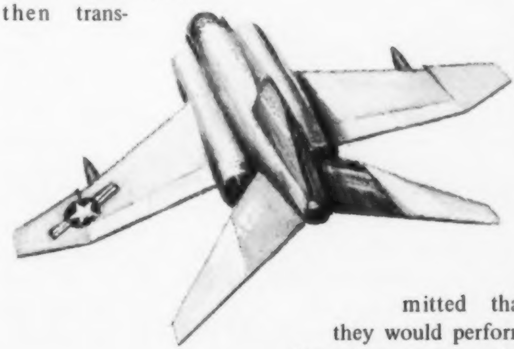
As a judgmental factor, let's consider minimum altitudes: Paragraph 750 of General NATOPS (OpNavInst 3710.7D), referring to acrobatic flight says that maneuvers shall not be conducted within 3000 ft of cloud formations or below 1500 ft above actual ground level. In the accident recounted above, these prohibitions were complied with; however, the engagement took place above a broken cloud layer which extended as high as 8000 ft. If the pilots considered this broken cloud layer as the deck, then it can be seen that they had little room for maneuvering and were in effect practicing ACM at an effective altitude of 4000 to 6000 ft. The crux of the matter is this: If you know that it will take 5000 to 15,000 ft to break a spin and pull out safely in your aircraft, does it make sense to practice ACM at 4000 to 6000 ft altitude. Well, it might because flight characteristics of an aircraft are considerably different at 5000 ft from what they are at 20,000 ft. But, if practice is going to be conducted at low altitudes, you need to take out some insurance and the only kind of insurance available is plenty of training at higher, safer altitudes. And, recognizing that realism in a training situation must be balanced by common sense. This will dictate that the aircraft be flown well within its flight envelope in order to positively avoid an uncontrolled flight situation where a safe recovery is known to be impossible within the altitude remaining.

The Flight Leader's Judgment

Another tragic accident occurred during a flight of four F-4Bs, operating from a carrier, who were performing maneuvers above an undercast. While this flight could not be strictly billed as air combat maneuvering, it did involve formation work and a tail chase. In this case, poor judgment on the part of the flight leader appears to be behind this accident although there were other factors to be weighed.

The flight departed the ship for bombing and aerial refueling practice. Prior to takeoff the brief had been accomplished, using the squadron's briefing guide, in order to insure that all aspects of the flight were adequately briefed.

After takeoff, it was found that there would be a delay in the availability of a tanker aircraft for practice and that there would also be a delay before the SPAR was available for practice bombing. The flight leader then transmitted that they would perform formation maneuvering until the SPAR was ready. The maneuvers were made with a constant power setting of 3000 lbs of fuel flow per hour per engine (to conserve fuel). Initial maneuvers were very mild and consisted of gentle climbs, dives and reversals. The airspeed ranged between 250 and 350 kcas and the altitude between 2000 and 5000 ft at this time. The flight was above an undercast layer of clouds, the top of which was approximately 1000 ft high. The flight maintained 10 to 20 miles range from the ship. Continued



The flight leader instructed the flight to assume a trail (tail chase) formation. This decision was made after carefully observing the ability of his wingman to maintain proper position throughout the formation maneuvers.

The tail chase maneuvers consisted of climbs and dives – and reversals were made up to plus or minus 45 degrees in pitch, 90 degrees angle of bank with airspeed ranging from 250 to 350 kcas and the altitude between 2000 and 6000 ft. During the course of the maneuvering, one roll was completed starting from a 20 degrees nose-up position and recovering with the nose 10 to 15 degrees below the horizon. Immediately following the roll the flight leader went into a 30-degree banked level turn where he observed the shadows of all three aircraft reflecting off the clouds. The number 2 aircraft was approximately one-half plane length behind the leader and number three was about one and one-half plane lengths behind number 2. The flight continued to perform various turning maneuvers for 2-3 minutes. Then, after steadying up momentarily at 3500 ft, the flight leader pulled the nose of his aircraft up to 20 degrees above the horizon and rolled left to the inverted position where he stopped the roll. The maximum altitude attained during the inverted phase of the roll was about 4000 ft and the minimum speed was 250 kcas. The flight leader allowed the nose to fall to a position about 30 degrees below the horizon and smoothly rolled to a wings level position (upright) passing through an altitude of 3000 ft. The airspeed was approximately 275 kcas when a 2-G pullout was initiated. On the pullout, the flight leader momentarily skimmed through the top of the undercast at an indicated pressure altitude of 1000 ft. The flight leader's aircraft was later estimated to have been in the cloud layer for 1 to 2 seconds. The number 2 aircraft maintained sight of the flight leader throughout the maneuver. Shortly after completing the maneuver, the flight leader transmitted, "Sorry about that." The flight leader then gave a visual signal to join up, however, the number 3 aircraft did not appear. The flight leader requested the missing aircraft to report its position but there was no response.

A Crusader launches for another training mission. Adherence to established rules for engagement in practice air combat maneuvering will go far toward insuring a safe return.

The site of the accident was located a few minutes later by a search helicopter in close proximity to the position where the final tail chase maneuver was performed. A limited amount of debris was recovered from the surface of the water. Neither the pilot nor RIO was recovered.

The most probable cause of this accident, as determined by the Board, was the pilot's spatial disorientation/vertigo at low altitude subsequent to the penetration of an undercast layer of clouds during the recovery phase of a modified roll. The flight leader, as already indicated, was criticized for leading his wingman into such a hazardous situation.

The reporting custodian stated in his endorsement to the AAR:

"The accident was discussed at length with him (the flight leader) in an attempt to gain information about what had led him to use uncharacteristic poor judgment in conducting the final maneuver of the tail chase. He cannot adequately explain how this lapse in judgment occurred. He was aware of the 1500 ft minimum altitude prescribed in the acrobatic flight precautions in General NATOPS (OpNavInst 3710.7D). He stated that he had forgotten about the requirement to maintain 3000 ft clearance from clouds. He was overly concerned with keeping fuel flow near the maximum endurance indication. Finally, he placed himself in a position in which his recovery to level flight in a smooth pullout with no more than 2 G placed him at 1000 ft – just above the clouds. This was not a deliberate maneuver. During the pullout, he considered increasing the G and pulling out as rapidly as possible, but elected not to do this since it might cause the wingmen to enter an accelerated stall."

There are many possibilities which could be discussed as to how this accident could have been avoided. Had the pilot of the lost plane been more experienced or alert to his situation, it is possible he could have broken off the maneuver before getting into such an extreme situation. In this connection, it is enlightening to consider the remarks of another endorsing officer regarding the RIO:

"The possibility of RIO error in technique/judgment must also be considered. The pilot, concentrating on the two aircraft ahead, may not have been aware of his low airspeed (and resulting low G available), etc. Although the RIO was considered exceptionally qualified and experienced, the possibility exists that he may not have

been advising and assisting the pilot to the fullest extent. This hypothesis is supported by the fact that investigation reveals that apparently none of the RIOs brought the NATOPS violation to the attention of their pilots. The transition from visual flight while maintaining position as number 3 aircraft in a tail chase to an unusual attitude in actual instrument conditions would tax the capabilities of even the most seasoned and experienced aviator. Though the pilot is always responsible and certainly should know the exact flight conditions at all times, crew interdependence is a natural result of Pilot/RIO relationship. In such situations the alert assistance of the RIO is essential to the safe operation of the aircraft."

Briefing for ACM Is Essential

A proper briefing prior to engaging in air combat maneuvering is of the utmost importance. This will not only eliminate the possibility of surprise last ditch type maneuvers (embarrassing to all concerned) but will also serve to dampen the type of foolish pride or impulse which might cause an individual to press the situation beyond common-sense limits.

An extemperaneous hassle which resulted in the loss of a plane and both its occupants drives home the hazards of undertaking ACM without thorough preparation. In this case, a T-28 instructor and his student were flying the last leg of a cross-country instrument training flight. As they proceeded along the airway, another T-28 appeared on the port wing of the first aircraft. After a few hand signals – then through radio communications – the pilot of the first aircraft identified the pilot of the other aircraft as a fellow flight

The equipment has changed but the lessons learned still apply and the mission is still to retain air superiority.

instructor from the same unit. And, like himself, he was returning from a student cross-country instrument training flight.

By mutual agreement, the pilots agreed to participate in simulated aerial combat.

During the initial stages of the simulated combat, T-28 number 1 was the defender but after several steep turns, dives and climbs he maneuvered his aircraft into a position behind T-28 number 2. The two aircraft then maneuvered in what amounted to a tail chase in the vertical plane. This consisted of dives of about 70 to 80 degrees with about 250 to 300 knots of airspeed, then a reversal into a climb of about 70 to 80 degrees until the airspeed dropped off to about 70 knots. T-28 number 1 (now the attacker) maintained 2500 rpm and 45 inches manifold pressure during the climb portion of these maneuvers. This maneuver was repeated several times and T-28 number 2 succeeded in extending the interval between the two aircraft. He had achieved such a separation that when he was approaching the apex of his climb, T-28 number 1 was just pulling out of his dive. Near the top of one of these climbs, T-28 number 2 stalled and entered an inverted spin. T-28 number 1 while commencing his climb observed the other aircraft spinning counterclockwise inverted. The aircraft continued to spin inverted in a steady state with approximately a 20-30 degree nose-low attitude with flaps partially down, until it collided with the ground. The aircraft was totally destroyed and both occupants were killed. Neither of them had made any apparent attempt to leave the aircraft prior to the crash.

The C.O.'s endorsement to the accident report stated:

"This accident is in the category which can only be considered to be a needless waste of pilots' lives and an aircraft through a lack of self-discipline and a flagrant disregard of existing directives."

Existing Directives

What are the existing directives governing air combat maneuvering? Well, we have to confess that we don't have any handy-dandy guide to *all* such directives. Nevertheless, there should be some benefit from a discussion of the subject.

- *Tactical Manuals for Aircraft.* The best guide to air combat maneuvering tactics will be found in the tactical manual for the series or model aircraft involved. However, these publications are devoted to an exposition of the air combat problem and are not primarily concerned with regulating the time and place of air combat maneuvers, briefings, minimum altitudes, general safety precautions, etc.
- *NATOPS Manual for Aircraft.* These manuals are not specifically oriented to air combat maneuvering but there are many situations where they would apply. Spin recovery procedures contained therein are an example.

Pipper on target, ready for the KILL!

- *NATOPS Manual, General Flight and Operating Instructions (OpNavInst 3710.7D).* Paragraph 615 of

this manual pertains to simulated aerial combat and states:

(1) Naval aircraft shall not simulate aerial combat with other naval aircraft except in the course of duly authorized operations and then only after all participants have been thoroughly briefed on the conduct of the flight.

(2) Unscheduled simulated combat between naval aircraft and aircraft of any other service or registry is forbidden.

(3) Under no circumstances shall naval aircraft make simulated attacks on any aircraft utilized as transport. Exceptions may be authorized by Fleet Commanders for fleet exercises where coordinated and scheduled simulated attacks against military troop transport aircraft are desired for training purposes.

Paragraph 750 of this manual deals with acrobatic flight. Since most air combat maneuvering falls within the definition of acrobatic flight, this paragraph also applies to ACM. Subparagraph e prohibits acrobatics (and ACM) under any of the following conditions:

(1) When during any part of the maneuver or recovery, the aircraft will be less than an altitude of 1500 feet from the surface or highest projection thereof.

(2) When horizontal visibility in all directions is less than 3 miles (5 miles above 14,500 ft).

(3) When during any part of the maneuver or recovery, the aircraft will pass closer than 3000 ft to any clouds.

(4) When above a lower cloud layer which consititues an overcast whose tops exceed 10,000 MSL.

(5) When between cloud layers wherein both the upper and lower layer constitutes overcasts.

(6) When unable to maintain safe clearance from other aircraft during the maneuver.

• *NWP 41(c).* Among other things, this manual contains information pertaining to hand signals, light signals and other communications information which would be useful in air combat maneuvering.

Other Directives

• *Flight Training Instructions.* These publications specify the conditions and requirements for practicing air combat maneuvering during the course of training student naval aviators.

• In addition to the directives already discussed, specific directives are issued from time to time by Fleet Air Commanders, RCVW Commanders and Squadron Commanders. These may vary somewhat in specifics but they have the common goal of insuring safety in practice ACM insofar as possible.

It is to be emphasized that the altitude limitations for acrobatic flight specified in the NATOPS Manual, General Flight and Operating Instructions (OpNavInst 3710.7D) are of necessity general in nature and apply to all aircraft. They apply to the T-34 as well as the F-4 or F-8. It might be perfectly in order to perform acrobatics in the T-34 at 3000 to 4000 ft but it may be another story in a different aircraft. For this reason, more stringent altitude limitations are usually specified by other commanders. The minimum safe altitudes to be observed can only be determined by a careful assessment of the more stringent limitations which may be specified by appropriate commanders, the performance characteristics of the aircraft involved and the ability and experience of the individual pilot.

The Pilot's Responsibility

Prior to engaging in ACM, you as an individual pilot should insure that you are in compliance with all appropriate directives. Though not intended as a complete checkoff list, you should observe the following precautions as a minimum:

• Do not engage in ACM unless scheduled or otherwise authorized to do so by competent authority.

• Conduct ACM only in approved and designated areas.

• Do not engage in ACM unless you are assured that your flight as well as all other aircraft involved have been properly prebriefed.

• Maintain radio contact with all aircraft involved unless specifically briefed to the contrary.

• Be aware of minimum altitudes. Recognize that Fleet Air, Air Wing and Squadron directives frequently specify more stringent altitude limitations than those set forth in General NATOPS.

• Be aware of your own limitations. You are perhaps the best judge of your capabilities and limitations. Do not push yourself beyond the limitations dictated by your experience and training. You should also be aware of the capabilities of the other pilots involved insofar as possible.

• Use the whole team. If you fly with an RIO, enlist his assistance whenever possible. An extra pair of eyes are invaluable.

• Know the stall/spin characteristics of your aircraft and know proper recovery procedures. Think these matters out beforehand. Keep your aircraft limitations in mind and be guided by existing flight parameters such as altitude, speed, power, etc., before deciding to undertake a maneuver.

Finally, be alert, use your good sense. Recognize it is a training situation and stop short of pushing your aircraft or yourself to the point where safe recovery is doubtful or impossible. And, if by some freak or great misfortune your opponent gets the best of you – relax and live to train again another day. ◄

Short Snorts

'Don't do nothing halfway, else you find yourself dropping more than can be picked up.'

Louis Armstrong

Automatic FOD

WHILE flying plane guard, in a racetrack pattern, the pilot of a UH-2C gave the crewman occupying the right seat permission to fire a .45 caliber pistol for practice, provided the direction of fire was away from the ships in the vicinity. The crewman held the pistol pointing downward in such a manner that upon firing the first round, a shell casing was ejected up and into the engine intake. The aircraft yawed left, then right. The torque on the No. 1 engine went to 55 percent and torque on the No. 2 engine went to ZERO. The No. 2 engine torque stabilized at 44 percent and the oil pressure warning light came on. The No. 2 engine was then secured and a single engine landing was made on the carrier.

AIRFRAME ICING REPORTING TABLE

Intensity	Ice Accumulation	Pilot Report
Trace	Ice becomes perceptible. Rate of accumulation slightly greater than rate of sublimation. It is not hazardous even though deicing/anti-icing equipment is not utilized, unless encountered for an extended period of time — over one hour.	Acft Ident., Location, Time, (GMT) Intensity of Type*, Altitude/FL, Aircraft Type, IAS
Light	The rate of accumulation may create a problem if flight is prolonged in this environment (over one hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.	Example: Holding at Westminister VOR, 1232Z Light Rime Icing, altitude six thousand, Jetstar IAS 200 kts.
Moderate	The rate of accumulation is such that even short encouters become potentially hazardous and use of deicing/anti-icing equipment or diversion is necessary.	Source: Headquarters Naval Weather Service Command Letter Serial: 80/1755 of 13 Dec 1968
Severe	The rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary.	

*Rime Ice: Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

Clear Ice: A glossy, clear or translucent ice formed by the relatively slow freezing of large supercooled water droplets.

Emergency Compounded

THE squawk box blared, "275 returning with an emergency." The squadron aviation safety officer quickly flipped the base radio channel selector switch to tactical frequency and turned the volume up. He listened as the aircraft commander outlined his problem and stated his intentions. The ASO then switched to tower frequency when the pilot did. A moment later he couldn't believe his ears. He grabbed the phone and called the tower. After talking to the tower supervisor he uttered an expletive and ran for the flight line to watch the landing.

The *Stoof* had been out about an hour when the pilot noticed the starboard a.c. generator and transformer/rectifier warning lights illuminate. The pilot twice attempted to restore generator operation by resetting the generator switch but he was not successful. The pilot then attempted to disconnect the constant speed drive (CSD); however, the disconnect cable disengaged itself completely and dropped into the cockpit. The pilot secured the engine. He declared an emergency on the tactical frequency, which was acknowledged, and then switched to tower frequency. He was cleared by the tower to enter downwind for the west runway. *Moments later an A-3 was cleared into the break for landing while the emergency continued.* (This is what had shaken the ASO – he had asked the tower to give the A-3 a wave off, and was refused.)

At the 180 degree position both aircraft were neck and neck. The *Stoof* was taking it kind of easy and was a little wide – outboard of the A-3. As the two planes turned base the S-2 was told to extend his pattern and "take interval." The A-3 touched down, got a bad chute deployment and blew both tires in an effort to stop. The *Stoof* by this time was on short final and although the tower directed a wave off, the pilot landed his aircraft and stopped well short of the A-3. Both planes were towed off the duty runway.

In retrospect, about the only thing that did NOT happen was brake failure in the *Stoof.* The whole day was not spoiled. There are a multitude of safety lessons here to be discussed. You ASOs have at it!

The emergency in the S-2 was caused by the locking plug backing off the CSD quick disconnect pin housing. As a result of this the squadron recommended a closer look at the flex cable plunger release pin. See MRC 60.1/66.1

Canopy Failure

WHILE A T-1A was cruising at FL 370, (cabin pressure altitude 18,000 ft), the canopy shattered. The canopy frame and jagged pieces attached to the canopy frame remained on the aircraft. The pilot landed the aircraft with no futher damage.

Investigators thought the most probable cause was that the canopy had been severely scratched or hit a hard blow by some unknown object. This caused the canopy to fail under the differential pressure conditions existing at flight altitude. Some sort of ground support equipment was suspected because of yellow paint and scratch marks on the side of the lower port air intake and small skin puncture marks on the upper port air intake.

No personnel injuries occurred during this incident. This is attributed to the fact that the pilots lower altitude and to the fact that both pilots were flying with their helmet visors down. *(It also points up the need for thorough preflight. – Ed.)*

Change Frequency

HERE'S an item gleaned from USAF Aerospace Safety, Sept 68 issue. "Approach Control cleared the pilot for an ILS approach and a change to tower frequency. Then Approach Control came back on the radio with a warning that there was traffic dead ahead on a collision course. The pilot made a violent turn and descended. He later estimated the miss distance to be about 75 ft. That he was able to take evasive action, in time, was attributed by the pilot to a procedure this crew uses. With two radios, when frequency change is necessary, one radio is left on the previous frequency. This permitted the crew to hear the warning even though one radio had already been changed to tower frequency."

O.K. So what else is new besides "Ho-Ho-Ho?"

(All of you lucky pilots with back-up systems can consider this idea. The rest of you just hope and pray that the tower operators, approach controllers or anyone with a mike will use the emergency frequency for such a transmission. - Ed.)

Behind the Stratus Layer

"Shortly . . . . we entered another stratus layer at about 14,000 ft and began to receive moderate turbulence followed by heavy rain or hail."

AT ANY time of the year the weather, out where the wheat and tall corn grows, can be pretty violent but especially during spring and summer. The frequent and sudden thunderstorms and tornados make this area suspect at all times. The weather in this mid-continent section, of about 14 states, from Canada to the Gulf, is like the little girl who "when she was good, was very, very good; but when she was bad, she was horrid."

A pilot and his crewman, departed MCAS Eastcoast enroute to MCAS Westcoast with a stop to refuel scheduled for a mid-continent airport operated by one of the armed services. It was not a spur of the moment type flight; nor was it a boondoggle. Considerable thought, study and planning had been spent getting ready, including a thorough rundown of emergency procedures. The purpose of the flight was twofold: to get the plane and crew out for phase training; and to deliver some spare parts, mail and pay checks to other squadron personnel already under going training.

The crew commenced briefing at 0830 for a 1030

departure. Everything proceeded on schedule until a last minute delay, caused by the line crew, in loading the aircraft. *(This aircraft was being flown cross-country with the following gripes: deviation of 20 degrees between the MA-1 and standby compass on a southeast heading; radar and both Stab Aug and AFCS inoperative. – Ed.)* However, an extension was received on the weather – excellent weather enroute with only a few scattered thunderstorms reported – and the flight departed about an hour and a half late. A "stop over" flight plan had been filed. (This is similar to the old 15 minute passenger stop.) After the pilot landed at his refueling stop he was directed to taxi to the hot-refueling area. The JP truck, accompanied by the MB-1, crash truck, awaited the aircraft and in short order had filled the aircraft. The pilot called for clearance and even after one abort, due to a temporary high cockpit temperature, was airborne and on his way to MCAF Westcoast after only 28 minutes on the deck. The pilot stated, "the previous weather enroute had

been broken to overcast and we were on top at FL 310. One large thunderstorm was observed . . . . and we diverted around it. Arriving at our refueling stop the weather observed from high altitude appeared to be broken, gradually becoming scattered. The cloud coverage was mostly in stratus and cirrus layers and we observed very few cumulus buildups. Coming into our refueling stop, and looking in the general direction of where we would be departing, no significant weather was noted." After takeoff the pilot cleaned up, established his climb and elected to fly on the gages as a matter of convenience rather than necessity. Yet, when queried by Mid-Continent Center whether any weather was in sight the crewman replied, "Affirmative. Numerous thunderstorms are in sight." The pilot took his eyes off the gages and looked outside and noted they were in the clear between stratus layers and dismissed the report his crewman had made. Seconds later "We entered another stratus layer at about 14,000 ft, climbing and began to receive moderate turbulence followed by heavy rain or hail. I considered making a left turn to get out of the weather but before I could start the turn the aircraft received two violent jolts. The force of the jolts seemed to be in the vertical plane and can best be described as a giant hammer striking the underside of the aircraft. The rate of roll and pitch of the plane was very rapid. I remember the crewman saying, 'There goes the gyro.' The turn needle was pegged to the right and despite all efforts I was unable to stop the turn. As the altimeter unwound toward 10,000 ft I told my crewman to eject and I followed him out."

The pilot and crewman never knew it but a Severe Weather Warning Area had been declared for the area in and around Mid-Continent Airport after they had departed MCAS Eastcoast. The various centers the pilot had communicated with, during the flight on the first leg, had not passed any weather information; neither had Mid-Continent Tower or Ground Control; and finally, since the pilot was on a "stop over" flight plan he had not left the plane and in this instance had not personally received an up-date on the weather.

As a result of this accident there are several things which we need to consider.

• It wasn't too long ago that an aircraft leaving one coast for the other was carefully checked and all gripes worked off before it departed. Despite the fact that now one can go coast to coast in four or five hours, good common sense would dictate all systems up; especially if the plane will be in an operational environment at destination for an extended period. In the "old" days a plane was automatically down prior to a cross-country hop if it had a bad gyro or turn and bank instrument. It would seem even more important now, with near sonic and supersonic flights, that the attitude instruments, radar and AFCS should be working properly. This was no bounce drill around the maypole at Homeplate. It was a flight of more than 2000 miles across water, mountains, desert and swamp.

• Communications has always been a favorite whipping boy and this accident is no exception. It seems that the pilot was a victim of a breakdown in communications. A condition existed which was hazardous to flight on his route and he was never advised. Since the Air Route Traffic Control Centers (ARTCC) have their hands full directing the flow of traffic the blame can not be laid at their doorstep. The pilot in this accident was not anywhere near Mid-Continent Center when the Severe Weather Warning Area was established. When he first checked in with Mid-Continent Center perhaps the Center could have inquired if he had received the latest advisory but this didn't happen. As far as Mid-Continent Airport is concerned where was the "old" what-can-we-do-for-you attitude? Certainly the tower or ground control should have passed along something as vital as a Severe Weather Warning Area since it was in their own back yard. Where's the hospitality that operations duty officers used to extend to transients? During the time that he was on the deck it's hard to understand why the pilot did not ask what the weather was like enroute and at destination.

• Pilots used to be subject to unusual attitudes every time they turned around. In a single-seat fighter unusual attitudes can't be induced by someone else but through practice in simulators, through review of spin and stall recoveries and in ready room discussions unusual attitudes can be a piece of cake. One wonders if the same degree of attention and the same amount of time wouldn't be worth while with this generation of pilots and planes. In this accident a straightforward climb suddenly turned to a can of worms. The pilot had been on the gages; how did he so suddenly lose control? Perhaps there is a design problem trying to rear its ugly head; or perhaps there is a problem of instrumentation.

• Who is responsible for staying clear of severe weather? The pilot in command! Double check that weather prior to departure and keep abreast, while airborne, by periodically checking with Metro.

The best procedure in thunderstorms is still a 180 but if you stumble into one, or if operational necessity dictates that you crack it, set up for best penetration and fly attitude, FLY ATTITUDE, *Fly attitude!* ◄

Stop 'Playing' Safe---Work at it.

AS
hop
by
wit
nor
left
lev
use

he
tha
flig
cha
pro
we
so
the
cha
imi
dro
sid
sig
lef
As
the
exc
rig
wh
att
wh
pa
an
ap
Co
Se
Ea

sh
ab
ve

di
a

Plenty of Time

THE CREW was strapped in their SH-3A on a routine ASW training flight from the CVS. It was a dual-purpose hop. It began with photography and then was followed by an ASW exercise. During the maneuvers associated with the ASW exercise the pilot sensed that all was not normal with the rudder controls. He was running out of left rudder in left turns and in order to fly straight and level an inordinate amount of left rudder pedal had to be used.

The copilot was asked to take control and see what he thought about the situation. The copilot confirmed that they had problems and suggested they break off the flight and return to the carrier. The pilots switched channels from CIC to tower to notify Pri-Fly of their problems and intentions but as so often happens they were unable to communicate. The tower did not answer so they switched back to CIC. CIC was asked to relay their predicament to the tower and the pilots switched channels again – this time to Guard. They requested an immediate spot but did not receive any reply. They dropped their gear, made an approach along the port side of the ship and looked for some kind of visual signal. The pilot waved off and made his last turn to the left. When he reached the 45 he was cleared to spot 9. As the pilot began to slow down for his attempt to land, the helicopter began turning to the right. The turn was excessive and the pilot waved off again, this time to the right. On his next approach he ended up at the deck while the ship was in a turn and the pilot decided not to attempt a landing for fear the helo would roll right over while the ship was heeling in the turn. The waveoff was parallel to the deck and then a right turn across the bow and back along the starboard side for his fourth approach. The turn toward final was a sharp one. Control over the helicopter was deteriorating fast. Several more right turns were made aft of the carrier. Each succeeding turn was sharper than the last.

The two pilots had talked it over while closing the ship and now decided to ditch rather than risk landing aboard the CVS with little or no rudder control and the very real possibility of an upset on the deck.

The flotation bags were blown and the chopper was ditched. The helicopter landed slightly nose down and in a right turn. The rotors were kept turning and the helo also kept turning. One of the crewmen investigated, as best he could, and reported very loose rudder cables in the cabin overhead (not completely free but several inches of slack). The exact nature of the problem was never determined. After quite a while the pilots finally secured the rotors. The helo had not been damaged in the ditching and was floating upright despite swells and waves. A large life raft was inflated and the crew abandoned the helicopter after taking "everything that was not nailed down." The crew was promptly picked up by another helo at the scene and returned to the ship.

The helicopter floated upright for about two hours after the crew abandoned it before it finally sank. Salvage efforts were not undertaken due to sea state.

After several endorsers had reviewed the accident report a senior addressed the problem: "Serious consideration (including calculated risks should the situation warrant) must be given to recovery of aircraft and equipment for investigation and possible preventative measures." Although open sea conditions were anything but ideal the senior stated, "No indications that conditions were so adverse that an attempt to salvage the aircraft during the two hours it floated upright, subsequent to the successful ditching, could not have been conducted . . . . . Only through continuous salvage attempts under less than ideal conditions (regardless of the ultimate results) will procedures and methods be established for recovery of expensive weapon systems and equipment from the open sea."

Many articles have been written by real pros in the rotor business on how best to keep control when the tail rotor is failing or has failed. For two recent articles involving tail rotor problems see APPROACH Oct '68 "An Evening Patrol" and Dec '68 "Helicopter Open Sea Salvage." In cruising flight when you have a problem with directional control, altitude and airspeed are your best friends. By using windstream effect (weathercock or weather vane) some helos will control very well even with complete loss of rudder control. A full autorotation (engines secured) with failed tail rotor drive, has been successfully made to the water with negligable yaw during descent and with only minor fuselage rotation during the flare and water landing.

1968

UNAUTHORIZED MANEUVERS

1961

UPON completion of an instrument training flight, while enroute back to the field, the instructor arbitrarily decided to demonstrate a vertical recovery to the student. The TF-9J was at FL 180, 370 kias as the instructor initiated the maneuver by pulling the nose straight up and reducing power to idle. Shortly, the nose of the aircraft was pointed straight up with no apparent forward motion and the airspeed indicator was reading *zero.*

The aircraft hesitated for a moment, then fell forward, wings level to a 60-70 degree nose-low attitude. As the aircraft passed the 50-degree nose-low attitude it started a smooth yaw to the left while simultaneously rolling to the right. The aircraft then yawed to the right and the roll reversed to the left. As the aircraft reached an attitude about 80 degrees nose low,

UPON completion of a basic instrument hop, while enroute back to the field, the instructor arbitrarily decided to demonstrate a vertical recovery to the student. After one successful recovery the F9F-8T (now designated as the TF-9J) was pulled to a 70-degree nose-high attitude at FL 250 and the airspeed was allowed to decrease to approximately *zero* kias. The aircraft snap-rolled right wing down and started into a spin. The instructor checked his instruments and put in right rudder. Power was retarded and the stick held in the aft position. Power was applied to various settings but none of these corrections had any apparent effect on the spin. At

the nose snapped sharply left and the aircraft entered a flat inverted spin at about FL 230.

The pilot neutralized the controls but without immediate effect. He then applied right rudder thinking this to be opposite to the spin. He had not bothered to check the turn and bank indicator and his application of right rudder was actually pro-spin rather than anti-spin. Since this action did nothing to slow the spin, the pilot began to pump the stick back and forth, also without noticeable effect. In desperation, he added power which only served to tighten the spin. He quickly reduced power to idle again, put out the speed brakes and applied full back stick and left rudder. This did the trick and the spin stopped almost immediately. Recovery was completed at 6000 ft.

Adapted from 1968 Incident Report

10,000 ft both pilots ejected receiving minor injury.

In analyzing the accident the board concluded that the pilot failed to recover from the spin due to improper analysis. Contrary to published procedures he attempted to determine which rudder to apply by referring to the ball in the turn and bank indicator, rather than determining the direction of the spin by reference to the needle.

The spin which was originally commenced as an upright spin developed into an inverted spin. Because of the instructor's incorrect analysis of spin direction he applied pro-spin vice anti-spin control thus aggravating rather than stopping it.

Reprinted from the March 1961 issue of APPROACH.

A Discussion

THE OLD SAYING that there's nothing new under the sun is certainly borne out by these reports. Both are almost identical except for their final outcome. The fact that the second aircraft was not lost, as was the first one, seems to have been due more to chance than to skill or judgment on the part of the pilot. Both incidents involved:

- Same type aircraft.
- Experienced instructors.
- Deliberate flight into conditions of *zero* airspeed.
- Unscheduled deviation from the flight syllabus and performance of an unplanned maneuver.

Although the instructors in these incidents had considerable experience they both demonstrated a lack of appreciation for the fact that the most docile jet trainer can turn into a wildcat when entering an inverted spin. CDR D. Z. Skalla, Chief Flight Instructor, U. S. Naval Test Pilot School, writing in the August 1968 issue of APPROACH had this to say about spinning the normally docile T-1A:

"The T-1A reacts alarmingly . . . . . the inverted spin phase is usually preceded by extremely violent post-stall gyrations, predominantly of the uncomfortable negative G type. The rotational energy from the maneuver apparently couples from axis to axis until the inverted spin finally develops. The gyrations are rather difficult to keep track of and bring the usual scientific descriptions from the pilot. Some that have been noted are:

(1) End over end tumbles in pitch, both positive and negative.

(2) Wing tip over wing tip tumbles in yaw.

(3) High roll rates.

(4) Mixed combinations of the above.

(5) 'You name it, I don't know what it did.' "

There is no reason to believe that any jet aircraft the Navy owns will perform less spiritedly in an inverted spin situation. And, since there exists no safe, standardized and approved procedure for the average naval aviator to *practice* inverted spins and recovery techniques in jet aircraft, good headwork dictates avoiding unnecessary maneuvering in flight regimes likely to result in an inverted spin.

An additional danger resulting from inadvertent entry into a spin as a result of an unauthorized maneuver seems to have been demonstrated in the 1968 incident. The pilot stayed with the aircraft, determined to effect a

recovery and finally succeeded at 6000 ft – 4000 ft below the altitude recommended by NATOPS for ejection. This persistence may be understood as an effort by the pilot to salvage a bad situation created by his imprudence and overconfidence. It turned out OK but it makes you wonder if he was adequately fulfilling his complete responsibility to himself or the student involved.

Spin Recovery Technique

The spin recovery technique specified in the appropriate NATOPS handbook should be followed; however, regardless of the type of aircraft involved it is necessary for the pilot to determine the direction of spin. It has been proven time after time that the only consistently correct way to do this is by reference to the turn needle on the turn and bank indicator. This was not done in either of the incidents.

The Undesirability of Zero G, Zero Airspeed Flight

The TF-9J and most other aircraft are limited to 10 seconds of inverted flight for two reasons: To prevent oil or fuel starvation. In flying an aircraft straight up to *zero* airspeed there is the possibility that this 10-second limitation will be exceeded, especially if recovery is effected by a zero G fall-off in a nose-high inverted attitude. And if an inverted spin occurs before positive G flight is regained oil starvation is likely to occur. Likewise, the engine may flameout from lack of fuel. Regardless of whether or not a flameout occurs, it is certain that the normal airflow to the engine will have been disturbed. If the engine is operating at a high power setting, this can easily result in an engine overheat condition.

Non-Standard Maneuvers and Flight Syllabus Deviations

An endorser of the 1961 accident stated, "The primary cause of this accident was the unauthorized and unnecessary execution of a non-standard flight maneuver . . . . This accident clearly illustrates the fact that syllabus standardization makes a direct contribution to aviation safety by assuring that only those maneuvers that are aerodynamically sound and fully understood are included in each phase of the syllabus. It is an example of one of the possible consequences of unnecessary deviation from a well-conceived and carefully prescribed flight syllabus."

The endorser of the 1968 incident expressed much the same sentiments concerning the execution of a non-standard flight maneuver. He stated, "This incident points up the fact that some of the instructors have been demonstrating zero airspeed flight to the students in order to remove their apprehension in low speed regimes. This procedure has been stopped. The vertical recovery procedure in the Flight Training Instruction is a safe, effective manner of teaching the student to recover from a nose high unusual attitude in the early stages of training. However, in the tactics stage, vertical maneuvers are used extensively and the students must be taught to fly the aircraft at slower speeds without resorting to *zero* G maneuvers except as a last resort. Nevertheless, going to *zero* airspeed is carrying this to an extreme. It is not an effective tactical maneuver and the possibility of entering a spin offsets any advantage or confidence gained from this maneuver. The immediate cessation of *zero* airspeed demonstrations by all pilots has been directed."

This same endorser, commenting on deviations from the flight syllabus, stated: "The practice of an instructor demonstrating aerobatics maneuvers in a designated area following the completion of high work on an instrument flight is considered acceptable as it has motivational value for the student and increases his knowledge of aircraft performance."

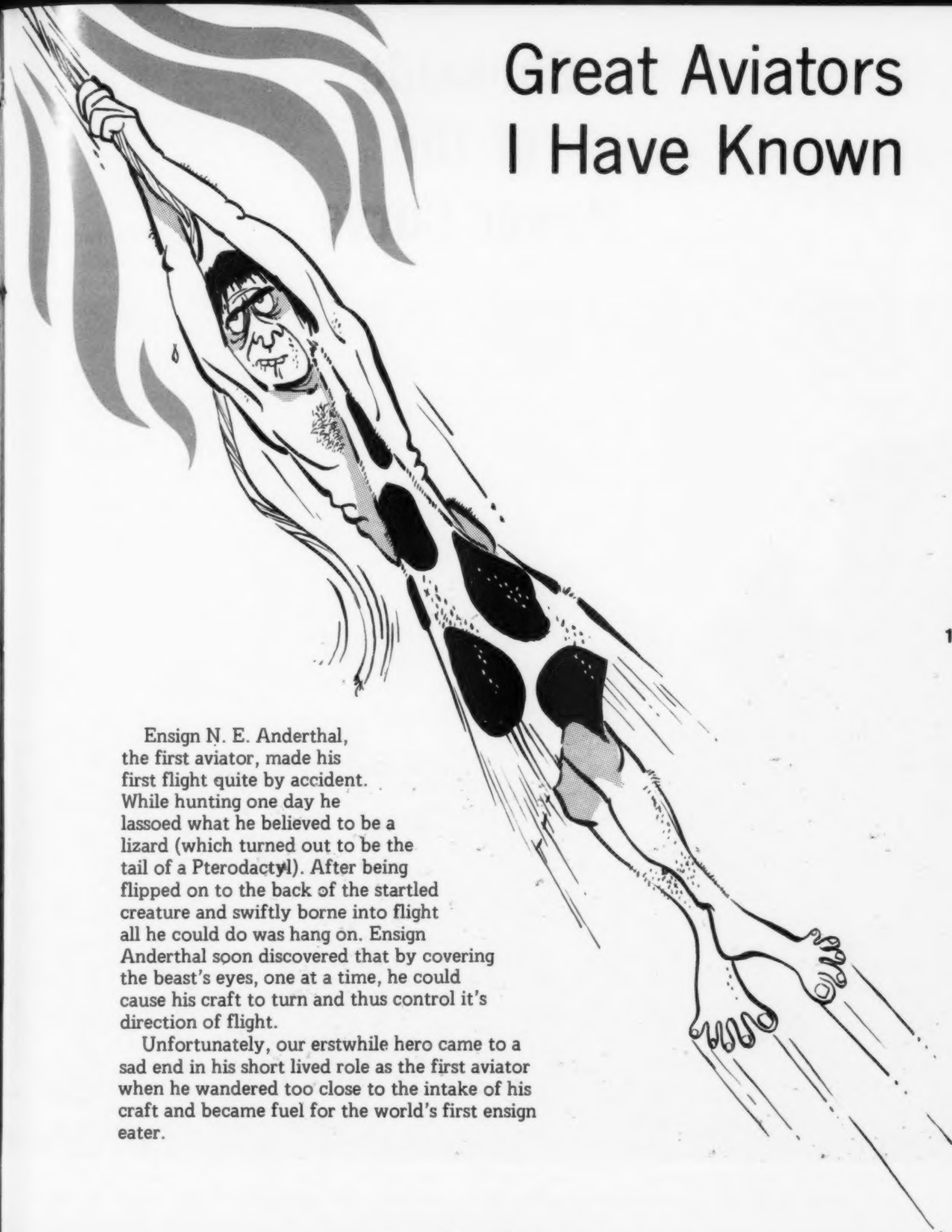
Conclusions

We hesitate to say there is never a time when a deviation from the flight syllabus is justified, more especially since the endorser of the 1968 incident has presented a substantial argument for such deviations. In addition, a blanket condemnation of *any* deviation from the flight syllabus simply would not conform to the necessities of naval aviation. However, deviations from a syllabus or the plan of any flight should never be made without good reason; they should not be the result of impulse and in every case personnel involved should weigh all factors carefully. In a case where regular deviations from a flight training syllabus are contemplated, it seems a much more effective and safer approach to the situation could be made by incorporating authority for such deviations *within* the syllabus. This would then provide the necessary framework for adequate briefings, stimulate thinking and provide a reminder to pilots that while certain deviations from the syllabus are approved, non-standard maneuvers are verboten.

Statistics Are No Substitute For Judgment.

Henry Clay

Great Aviators I Have Known



Ensign N. E. Anderthal, the first aviator, made his first flight quite by accident. While hunting one day he lassoed what he believed to be a lizard (which turned out to be the tail of a Pterodactyl). After being flipped on to the back of the startled creature and swiftly borne into flight all he could do was hang on. Ensign Anderthal soon discovered that by covering the beast's eyes, one at a time, he could cause his craft to turn and thus control it's direction of flight.

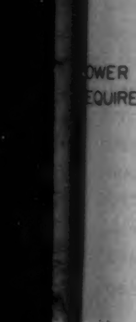
Unfortunately, our erstwhile hero came to a sad end in his short lived role as the first aviator when he wandered too close to the intake of his craft and became fuel for the world's first ensign eater.

Backside of the Power Curve

ca
in
Ar
co
We
co

co
or
pu
ass
tho
bre
san
are

Cu
fix
var
(Fi



T
be:
Pow
the
gear
doo
reac

T following article is reproduced from the Fl ht Safety Foundation, Helicopter Safety Bu etin 68-608/609 for September/October '6

"POWER SETTLING," "Settling With Power," or call it what you will, has been a subject of discussion in the Helicopter Safety Bulletin over a period of time. And now comes an article written by a professional copter handler who recently was added to FSF's staff. We are printing it here in its entirety . . . and await your comments.

Over the years almost all pilots have become conversant with the term "Backside of the Power Curve" or "The Region of Reverse Command." While widely publicized and read these particular terms normally are associated with jet and other fixed-wing aircraft. Even though the chopper pilot is supposed to be a different breed of cat altogether, he nevertheless is faced with the same problem of the "Backside of the Power Curve" as are the rest of his cohorts.

In order to fully understand the Power-Required Curve for helicopters, which differs only slightly from a fixed-wing aircraft, the first items to consider are the various parts that make up the total power required (Figure 1).

Power is the power required to accelerate the air downward to create the rotor lift. Since the weight of the helicopter is constant for any particular flight segment, no change of lift is required. However, as the aircraft moves through the air, more air moves past the rotor blades to produce lift. Thus forward flight requires less energy to be expended to force the air over the rotor blades and the Induced Power diminishes as the forward speed increases. Rotor Profile Power is the power required to turn the rotor through the air. Since the rotor speed is substantially constant in all phases of flight, the influence of forward speed is not of great importance. The combined effects of Parasite Power, Induced Power and Rotor Profile Power are shown in Figure 2.

Figure 2 is the power-required curve for a helicopter with power required plotted vs. airspeed. The curve has been divided by a vertical line drawn through the minimum power-required point. Stability is labeled to the right of this line and Instability to the left. Assume that we are in straight and level flight with a certain

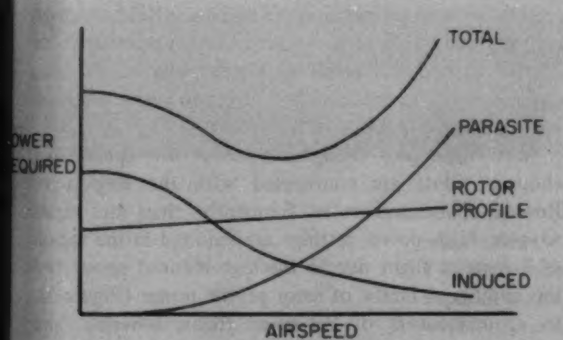


Figure I

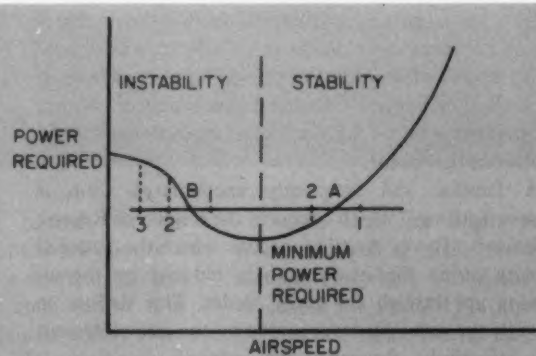


Figure 2

This (Fig. 1) shows the three components to be: Parasite Power, Induced Power and Rotor Profile Power. Parasite Power is the power required to overcome the parasite drag of the fuselage, rotor hubs and landing gear. Parasite drag is more commonly known as "barn door" drag. Parasite Power is zero while hovering and reaches the upper limit at maximum speed. Induced

power setting and at a certain airspeed (point A on the curve). If we were to encounter a gust of wind that causes the helicopter to increase airspeed to point A 1, it is evident that a higher power would be required to maintain this airspeed or there is a deficiency of power. If this higher power were not applied and the attitude or nose position was not changed, the aircraft would slow

to the original airspeed. The tendency for the helicopter to return to the original airspeed is determined primarily by the longitudinal stability of the aircraft. Although aware of the relatively poor stability characteristics of rotary wing craft, a certain amount of stability does, in fact, exist. If a gust of wind causes the helicopter to slow down to point A 2 on the curve, less power would be required to maintain this airspeed or an excess of power exists. However, if no power or attitude changes were made, the aircraft would accelerate to the original airspeed. Consequently, we can see that above the minimum power-required point on the curve, a condition of stability exists. This is the Region of Normal Command, since the helicopter has a tendency to return to its original speed if some outside force causes it to deviate from this speed.

Consider, now point B on the curve with a certain power setting and a certain airspeed. If a gust of wind causes the helicopter to speed up to point B 1 on the curve less power is required to maintain this airspeed, or an excess of power exists. If no power or attitude changes are made the helicopter will continue to accelerate or climb. To return to the original airspeed, a reduction in power or an attitude change is required. If this gust of wind causes the helicopter to slow to point B 2, more power is required to maintain this airspeed or a deficiency of power exists. If no power or attitude changes are made, the aircraft will continue to slow down due to this deficiency of power.

Compare this condition with the one previously discussed in the Region of Normal Command, point A 2, where a loss of speed occurred. We see that the reverse is true and it takes more power to go slower. We are now in the Region of Reverse Command. We have all been in the Region of Reverse Command at one time or another but perhaps now we have a logical explanation for the conditions that occur.

A familiar and frequently encountered term is "Power Settling," which occurs in the Region of Reverse Command. Power Settling occurs when the induced velocity along the blade span is reduced by the air flowing up through the rotor blades. This airflow up through the rotor blades is caused by the rate of descent and effectively decreases the induced velocity along the blade. At the outer portion of the rotor blade, where the induced velocity is the greatest, the rate of descent is less than the induced velocity and the resultant flow is downward. At the center of the blade, where the induced velocity is quite small, the rate of descent is greater than the induced velocity and the resultant flow is upward. The combination of this airflow through the rotor blades results in a net airflow mass of zero and a net thrust of zero. In this case, the helicopter is in a free fall and high rates of descent are common. If sufficient altitude were available for this maneuver, we would see that this free fall condition is of short duration since it causes a greater upward flow of air on the rotor blades until all the air is flowing upward. In this condition the helicopter is in autorotation and lower rates of descent will result.

Let's now assume an approach to a landing with a reduced power setting and at an airspeed below the minimum power required point on the curve (point B, Figure 2). As we keep coming back on the cyclic stick to decrease the forward speed in the approach, the rate of descent will increase unless additional power is added. The addition of power will slow the rate of descent but if this rate of descent has been allowed to reach a high value, the power required to stop the rate of descent may exceed the power available. In this particular case the one way to recover would be to push the nose over and gain airspeed to a point where the power required is equal to or less than the power available. The urge to pull the nose up and stretch the glide is all too powerful but it will never work. If sufficient power or altitude is not available, we become another item in aircraft accident statistics.

Contrary to popular opinion, recovery can also be effected, if sufficient altitude is available, by reducing the throttle, decreasing collective pitch and entering autorotation. As soon as a normal autorotation is established with proper airspeed and rotor RPM, a power recovery can be effected. An autorotation recovery from Power Settling will result in a great loss of altitude, consequently the procedure of diving to regain airspeed is the preferred method.

Most helicopter flying is done at low speed, and chopper pilots are confronted with the Region of Reverse Command more frequently than the fixed wingers. High power settings are required in the region of low-speed flight due to the high induced power and the additional factor of rotor profile power (Figure 1). In all maneuvers of low-speed flight, hovering, and approaches, where the power required may exceed the power available, a sacrifice in altitude will be required to regain airspeed and to prevent Power Settling. Plain old brute strength on the controls will never correct an error in judgment, but a thorough understanding of the Power Required Curve will help in all circumstances.

Taxi Troubles

Crunches can be costly.

Construction hazards on the main taxiway caused the pilot of a T-33B to select a shortcut through a parking ramp area. Parked A-4s were on one side and a blast fence on the other. When passing a particular *Skyhawk* the route was reduced to a width of 55 ft. Apparently concentrating on being definitely clear of the other aircraft, the pilot neglected to ensure clearance on the other side. The left wing tip tank collided with the fence ripping open the underside of the full fuel container.

Seeing that fire might result from the spilling fuel, the crew secured everything post-haste and evacuated the aircraft. Fortunately, fire did not occur. The tip tank had to be replaced.

This accident need not have occurred if the pilot had utilized the midfield taxiway as directed during the period of construction. Secondly, if he had called for line personnel assistance, he could have been safely guided through the narrow area.

ON THE GLIDE SLOPE

Jet Stream Review

As a man flies higher and higher, he encounters atmospheric phenomena which he must understand in order to fly safely at these altitudes. Military jet aircraft, of course, have been operating at high altitudes for a number of years. Pilots flying at these altitudes are confronted with such atmospheric phenomena as the tropopause, the jet stream and clear air turbulence. The following will explain the relationship between the tropopause and the jet stream and also show how and where clear air turbulence is found in the jet stream.

The Tropopause

The tropopause is simply the boundary between the troposphere and the stratosphere. It is found at altitudes of 50,000 to 60,000 ft over the tropics and between 25,000 to 30,000 ft over the poles. Sometimes the boundary extends unbroken from the tropics to the poles but, a break in the tropopause in the mid-latitudes is the more common situation with both the polar and tropical tropopauses lying in gradual slopes and sometimes overlapping each other.

Because of the frequent presence of strong wind shears in the vicinity of the tropopause, this boundary zone is often a region of turbulence. Since the zone is mostly devoid of clouds, this condition is classified as "clear air turbulence" or "CAT."

The strongest jet streams are usually found near the break region between the polar and tropical tropopause (see fig.1).

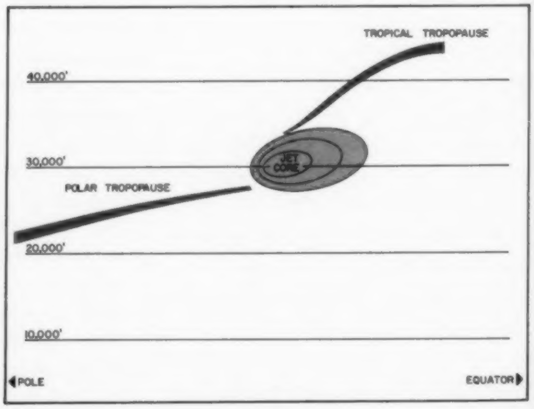


Fig. 1

The Jet Stream

The jet stream is a narrow, shallow, meandering river of strong winds which usually extends around the temperate zone of the earth and is located in regions where there are large differences in temperature between warm and cold air masses.

A jet stream is considered to exist whenever winds of 50 knots or stronger are concentrated in a band at least 300 nautical miles long. Wind speeds in the jet stream may reach 300 kts but generally are between 100 and 150 kts. Since the jet stream is stronger at some places than at others, it rarely encircles the entire hemisphere as a continuous river of air. More frequently it is found in segments from 1000 to 3000 miles in length, 100 to 400 miles in width, and 3000 to 7000 ft in thickness (see fig.2).

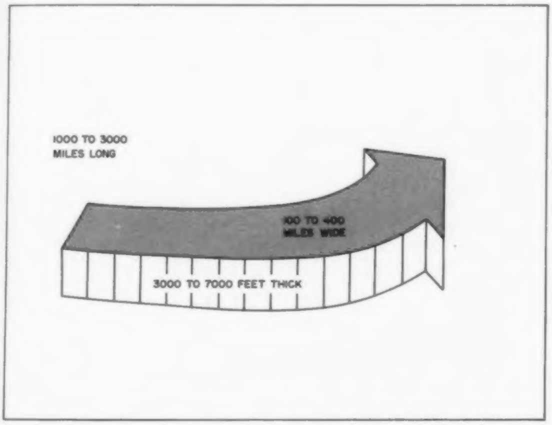


Fig. 2

The orientation, location and size of the jet stream varies with the seasons. In the middle and higher latitudes, the strength of the jet streams is greater in the winter than in the summer. The mean position of the jet stream moves southward, its core rises to a higher altitude and on the average, its speed increases. Winter jet streams often are found as far south as the 20th parallel. The strongest winds are normally found between 25,000 and 40,000 ft, depending upon latitude and season.

Sometimes there may be two or more jet streams in existence at the same time. For example, considering North America, one jet stream can be located over Canada and an equally well defined one, known as the "subtropical jet," can be over the southern United States.

If *you* have a question concerning any phase of instrument flight for which you cannot find a satisfactory answer, send it to the Commanding Officer, VA-127, NAS Lemoore, Calif. 93245, who has volunteered to do the necessary research and supply the answers.

Clear Air Turbulence

The term "clear air turbulence" is used to denote the rough, washboard-like bumpiness which sometimes buffets an airplane on a cloudless sky. This bumpiness may be of sufficient intensity to cause serious stress on the aircraft and physical discomfort to its pilot and passengers, especially since the turbulence occurs without any visual warning. *"CAT" can be present at any altitude.* However, it is found most frequently at higher altitudes in association with marked changes of wind speed with height (vertical wind shear). These conditions most often occur in the jet stream. Figure 3 shows the areas of severe air turbulence as related to the jet stream core. Note that the area of maximum severe turbulence usually occurs on the *north side* and at the *lower altitudes* of the jet stream. Areas of "CAT" in the jet stream are often found to be 2000 ft in thickness.

Pilots flying in or near the jet stream should familiarize themselves with the available weather reports and forecasts concerning clear air turbulence and whenever possible *avoid* areas in which severe "CAT" is reported or forecast.

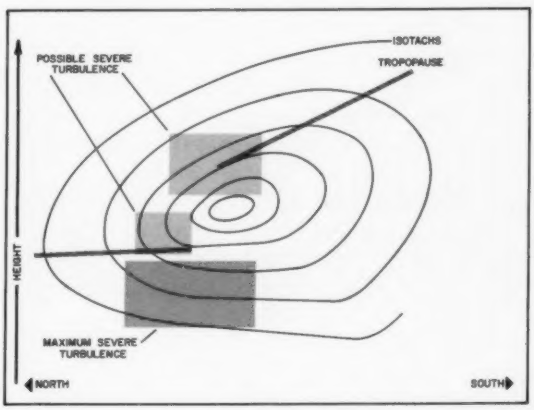


Fig. 3

Hung ordnance
or
jammed guns
can present
a problem while flying over
populated areas.

ONE WINTER afternoon in Metropolis an unfired 20 MM round fell through the carport roof of a private residence. It made a hole in the roof 4 in by 12 in but caused no injury to anyone. The only clue was that the owner had heard, but not seen, an aircraft overhead just before the incident.

Approximately a half an hour later, only a couple of miles away, in the same general area a second unfired 20 MM round fell through the rear window of a moving automobile. The shell shattered the glass, glanced off the shoulder of a back seat passenger and ended up in her lap. Other than shattered nerves there was no injury. The driver of the car stopped and all occupants got out. As the back seat passengers exited the car the round fell to the floor of the car. A policeman, who had appeared, retrieved the round and logged its markings. Later it was found to be identical to the first round which had fallen through the carport roof.

The ammunition was subsequently identified by the markings as part of a lot in use at NAS Nearby. Both rounds were inspected by qualified ordnancemen and it was verified that the rounds did come from NAS Nearby and both rounds had been chambered in guns prior to falling out. In reconstructing the events of the day the flight schedule was checked. There were five aircraft scheduled for gunnery that day and all carried 20 MM ammunition. By checking airborne times and positions three aircraft were eliminated. Of the remaining two planes each had returned from the operating area with all ammunition expended from one gun but with the other gun jammed and not fired. Pilots of both planes were contacted and each stated that he had safed his guns and switches prior to returning to the Metropolis area. They both had then proceeded to another base to practice ground controlled approaches. This put both planes in the area where the rounds had fallen out. The GCA pattern was such that either could have dropped the round which went through the roof of the carport but, by virtue of time, only one plane was in the pattern and could have dropped the round through the car window.

How could the ammunition have fallen out of either aircraft? When the landing gear is lowered and the gun switch is READY the guns automatically eject any ammunition in the guns at the time. Until the switch is SAFE the guns will reload when the landing gear is raised. The cycle continues indefinitely.

Both aircraft were checked and cleared of any gun system defects. Records showed that about 50 rounds of unfired 20 MM ammunition were removed from each plane on the day in question. After the planes returned from the gunnery hop the plane captains prepared them both for the next flight long before there was any inkling that the planes were suspect. Pilots, plane captains and ordnancemen were interviewed and no one could remember the switches being other than SAFE.

To preclude any further ordnance from dropping on the citizens of Metropolis a procedure was initiated whereby any *aircraft* returning from the operating area *with an ordnance malfunction* (hung ordnance, jammed guns) will *land at an outlying base and de-arm before flying over populated areas.* Additionally, as the commanding officer pointed out, the importance of pilot's completing checklists cannot be over stressed. ◄

Red Light Blindness

by William L. DeGinder, M.D.

COULD YOU read the rest of this page by the red illumination of your cockpit lights? Are you sure? You may be reading this without glasses but you could still be subject to "red-light blindness!"

This visual handicap develops gradually and it eventually affects most pilots, including many who still seem to have "perfect vision" under daylight flying conditions. Pilots who fly after dark only on rare occasions sometimes discover this peculiar disability suddenly. If you are approaching or passing 40 years of age, it might be a good idea to try reading some fine print by red light before your next night flight. Otherwise, you could find out the hard way.

Let's suppose that you have done no cross-country night flying for several months. You take off in perfect weather just a little before sunset. Everything is going fine but you need to find the frequency of the next VOR and make some cross-checks on your exact position. It's now dark in the cockpit so you turn on the red map lights and spread a chart on your knees. You can't read it there so you pick it up for a closer look . . . still blurred. You move the chart right up under the red light, then your eyes widen and your forehead wrinkles with strain as you try to focus the fuzzy figures. That's red-light blindness.

How Does Red Light Blur Vision?

The eye and the camera are surprisingly similar (Figure 1). In both, a lens system collects light and forms a picture image. The amount of light entering the eye or camera is regulated by a circular iris behind the first lens component. The correct amount of light then passes through a second lens component for final focusing into a sharp image on the light sensitive surface of the retina in the eye or film in the camera.

The camera's lens must be moved forward or backward from the film to focus the light rays precisely upon the surface. Instead of moving forward or backward, the lens system of the human eye focuses automatically and almost instantly by a remarkable mechanism that causes slight changes in contour and thickness of the second lens.

To see something close, we focus the picture by contracting a circular (ciliary) muscle about the rim of

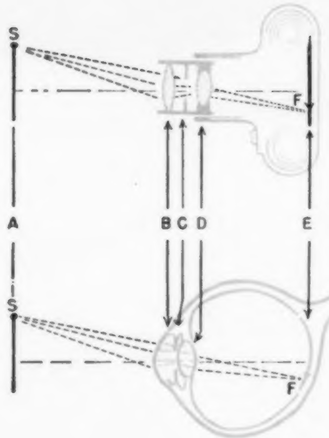


Figure 1
Focusing mechanics of camera and eye.

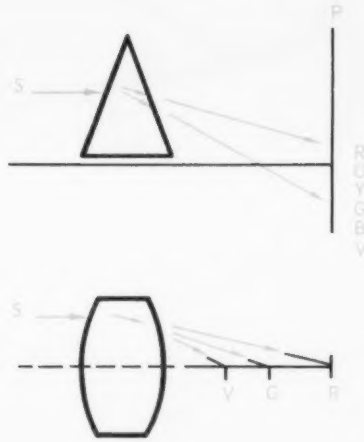


Figure 2
Light dispersal by prism and lens, with red falling most distant from the lens.

The letters in Figures 1 and 2 above represent the following: S= source of light; A= plane of light source; B= fixed lens in camera and cornea of eye; C= variable diaphragm in camera and iris in eye; D= adjustable lens in camera and lens in eye; E= plane of focus; F= film in camera and retina in eye; P= plane of focus; ROYGBV= spectrum from red to violet.

this lens just exactly the right amount to increase its thickness and curvature enough to produce a sharp picture image on the retina. Moving the object closer requires stronger contraction of the ciliary muscle and greater change in contour and thickness of the lens.

For each individual there is a limit of close focus. Some individuals can barely focus at arm's length in bright illumination (moderate farsightedness). After the eyes have been used for 40 years or so, this extra effort becomes less and less effective even with good illumination (presbyopia). Looking at small type under red light illumination forces the eyes to work at the greatest possible disadvantage.

Some Over-Simplified Optical Fundamentals

When white light passes through a prism, the constituent wave lengths or colors are bent to different degrees and emerge in a rainbow spectrum (Figure 2). Light passing through a simple converging lens is also dispersed to some extent as it converges behind the lens. This dispersal of colors is most pronounced when light penetrates the peripheral part of a rather thick lens (chromatic aberration). Therefore, the precise focal points of the various colors of light are found at slightly different distances behind the lens. The human eye and the more expensive cameras have built-in features to compensate for this. But the compensating factors are inadequate under the conditions we have described.

Color dispersal is most severe when light penetrates the peripheral part of the lens and it is almost insignificant when a small iris confines light to the central part. The pupil dilates to its maximum under dim red light, attempting to admit more light to the retina. At the same time, the lens increases its curvature and thickness, attempting to focus a sharp image of the print at short distance. Both of these factors decrease the optical efficiency of the simple lens system and the image formed by the red light has a tendency to focus behind the retina.

The result of this is that the print appears blurred. Some extra effort to contract the ciliary muscle and increase the curvature and thickness of the lens a bit more might make it possible for a young person to go ahead and read the print even though he might feel some sensation of eye-strain. If the lens system is no longer able to make this extra effort to bring red light into sharp focus upon the retina, the image remains blurred.

A pilot who passes all of the standard eye examinations under standard conditions of illumination may still find himself unable to read the vital figures and facts on his flight charts under red-light illumination.

This article reprinted from TAC Attack, February, 1968, first appeared in Flying Magazine.

ROPE and HOIST

WHEN their F-4B was struck by enemy ground fire on a bombing run, pilot and NFO ejected. Both men were rescued by helicopter. Survival lessons can be learned from their narrative accounts of the experience.

Pilot: "As the aircraft was hit by unknown heavy caliber fire, it started to tumble and burn. With fire and dense smoke in the cockpit I ejected on the third tumble at an altitude of 200 to 300 ft when I felt the sky was above my position vice the ground. The ejection was smooth; I did not feel the seat separate or the chute open.

"Seconds after chute opening, I landed in tall elephant grass. With no trouble I unhooked my chute, released the leg straps and stood up. All equipment had worked fine. My left boot was torn at the steel toe but my foot was uninjured. I was OK although my back was stiff and my neck and the back of my left leg were sore. My right arm hurt where fire had singed it a bit. *(The pilot had cut vents in the sleeves of his nomex flight suit for comfort. – Ed.)*

"Hearing automatic weapons fire nearby, I elected to move away from my parachute. I went 50 ft further into the grass and stopped and listened. Then I reached for my survival vest and it was missing. For a moment panic set in, then I got hold of myself and quickly evaluated my position. I saw a helicopter overhead circling so I made my way back to my RSSK (rigid seat survival kit) thinking my vest might have fallen off where I landed but it wasn't there.

"About this time the helicopter was coming down for a closer look. I opened the RSSK, took out the signal flares and popped a day smoke. A second helicopter, Army, I believe, came down about 50 ft away and hovered. I signalled him with a second flare and he moved to my position. Because of the 6 to 8 ft height of the grass he could not get close to the deck. He had no pickup hoist. Hands were extended to me and I was lifted upward by my right wrist.

"At about 10 ft, the hand holding me slipped and I fell backwards to the ground and landed on my back in the grass. A second attempt was made with two people lifting me by both my hands – same result. A third attempt was made with a 1/2-inch rope tied around my body but the helicopter crew could not get me high enough to get into the door. I was lowered back to the ground for the third time where I stood and waited for the next move.

"The rope was pulled in and the chopper pulled away 10 to 15 ft. Within minutes it returned and the crew dropped a sling, fashioned out of the same rope, for me to put my feet and arms through. I did so with difficulty and they pulled me upward. As I reached the level of the landing skid, I threw my leg over it, lightening the weight that they had to lift, and they rapidly pulled me up and through the door. Once I was aboard, they rolled left and egressed the area.

"While they were working to get me in the helo, I heard automatic weapons fire and I believe the helo was under fire. The helo pilot and crew were extremely courageous.

"On return to base I discovered that I had inadvertently left my survival vest in the hot pad alert shack and had flown the flight without it. I realize the danger of this careless act and consider myself fortunate that I did not require a radio to direct the pick up."

NFO: "We rolled in, took a hit, became uncontrollable and were covered with flames. After one left roll/tumble, I ejected using the seat pan firing handle. I only remember intense heat, then I was in the parachute. The seat worked as advertised. I looked around and saw the aircraft burning on the ground. I saw

that I was fairly high and began preparation for jungle entry. I lowered my helmet visor which had blown half-way up, unhooked the right rocket jet fitting, allowing the seat pan to fall, and assumed the landing position. *(Recommended procedure is to release the left fitting so that the seat pan will fall to the wearer's right side. – Ed.)* I hit flat on my back on a 20 to 30-degree slope next to a small creek and trail. After unhooking the chute, seat pan and oxygen mask, I removed my helmet and listened. I detected nothing unusual so I opened the seat pan and took out the survival gear.

"Having what I wanted, I then began to move up the slope through heavy elephant grass, brambles, vines and small trees. On reaching the top of the rise and finding myself in a relatively clear area, I stopped and began deploying my gear. I readied a day/night flare, got out my compass and started beeping on the PRC-10 survival radio. I established contact with the rescue forces. There seemed to be four UH-2B's, one 0-1 and one 0-2 circling my position. I called the 0-2 and told him my position in relation to him.

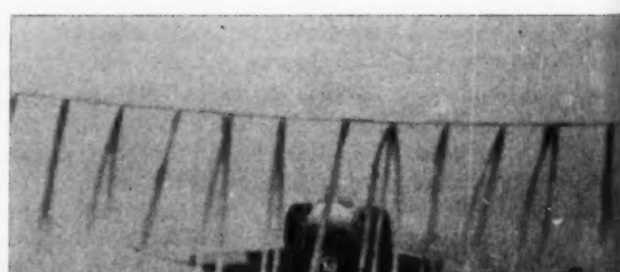
"The choppers began to circle closer and one asked me to pop a smoke flare. I did so, heaving it into the grass 20 to 30 meters from me. I threw it because a machine gun had opened up 100 to 150 meters from me and I didn't want them to spot me. Almost immediately one UH-2B began hovering some 70 meters from me. I began directing him with calls of 'Move three o'clock at 50 meters, now 2 o'clock at 10 meters,' etc. When he got within 5 to 10 meters, his rotor wash blew the brush below my waist and the gunner spotted me. They began to lower the hoist hook about 10 meters from me. I made my way to the hook, fastened it to my torso harness D-ring and was pulled aboard.

"I feel that the squadron's emphasis on ejection, survival and rescue was a tremendous aid in this situation. I feel that this training enabled me to respond with relative calm and confidence from the time of parachute deployment until pickup."

A Bit Unusual

Aircraft lifts off the deck on a bolter.

Photo of aircraft taken during fly-by shows port MLG strut. Note missing wheel.



Frontal view through the barricade shows the aircraft just prior to touchdown.

"UNUSUAL" is the word to describe the escape of the F-4B pilot and RIO in this story.

Combat strike completed, the *Phantom II* boltered on its first pass to get aboard as the port main landing gear wheel dropped from the aircraft following touchdown. After airborne refueling was accomplished the decision was made to recover by means of the barricade. The main gear stub engaged the No. 3 cross deck pendant and commenced withdrawal of the wire but the tailhook did not engage any of the CDPs. The aircraft engaged the barricade and continued straight ahead until the nose gear was 40 ft beyond the No. 4 CDP when it yawed severely left and set up a left drift. The tug of the barricade on the right wing counteracted some of the yaw but did not alter rollout direction and the aircraft went over the side, secure in the barricade until contacting the water.

As the *Phantom's* nose struck the water, the pilot ejected. *(The aircraft had the Mk-H5 ejection system. – Ed.)* The seat traveled upward and rotated forward, the rear and bottom striking the angle deck overhang. The accident report states that the seat with the pilot still strapped in then fell back into the water in a head down position. Observers next saw the pilot abeam of the LSO platform.

Meanwhile the RIO had tried to eject but had only succeeded in getting rid of the canopy. He climbed out of the cockpit and gripping the front seat ejection tube and the aircraft turtle back, stood on the seat. The aircraft, suspended by the barricade only, was buffeted severely by the planing action of the submerged nose and waves which at times engulfed him.

As the ship slowed, the motion of the aircraft became less aggravated and the RIO was able to leap clear of both the aircraft and the tangled barricade straps. Both survivors were retrieved by the plane guard helo in the wake of the ship at a distance of less than a mile.

Now let's pick up the F-4 pilot's narrative as his aircraft touches down . . .

Pilot's Narrative

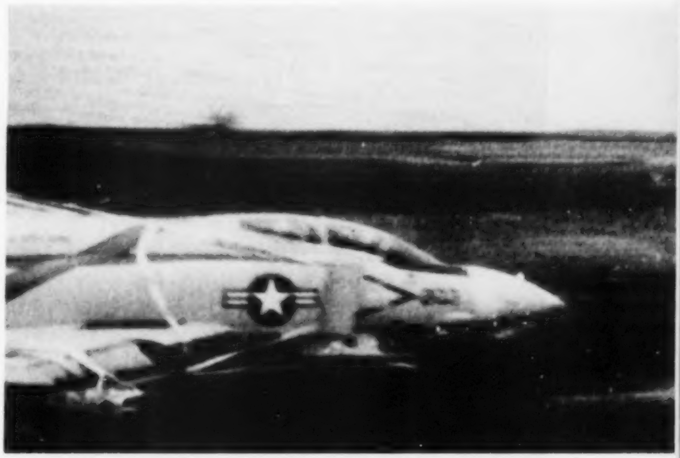
"Shortly after I touched down, the aircraft attempted to veer to the left," he begins. "I knew that the rudder would not have any effect on the rollout, nor would any other control agencies. It was apparent that we were going to go over the port side.

"I reached for the face curtain to eject but as we approached the catwalk we began to slow down. From the cockpit it appeared that we were going relatively slowly and the barricade was going to hold so I let go of the face curtain. The next thing I knew, we were going straight down into the water.

"My first thought was that we were going to have a gear hang-up with the airplane dangling over the side. I realized as soon as I saw the nose of the aircraft start to enter the water that obviously I was wrong. I didn't want to eject for fear that I would come out and hit flat onto the surface so I elected to remain with the aircraft.

"At this time we went under the water, though I don't know for sure how far. I remember thinking I'd heard that airplanes normally bob up to the surface at least once. During this time, although there was some water in the cockpit, it remained relatively dry. It began to get a little lighter inside the cockpit which indicated that we were starting to bob to the surface. I reached up and ejected. *(The forward cockpit had a considerable flow of water around and over it and the pilot had no chance to see outside, investigators said. The aircraft was also rolling slightly, causing the cockpit to seem darker when pointing toward the ship and lighter when pointing away.)*

"I elected to eject as opposed to blowing the canopy and crawling out," the pilot explains, "because I felt that we might possibly be upside down. If the plane had



This photo shows the aircraft just as the left yaw starts to develop.

been upside down and the canopy had blown, the cockpit would have been full of water and I might not have gotten out in time. To backtrack just a bit, let me mention also that as we were going over the side, I attempted to tell the RIO to eject but when I yelled into the mike, there was no feedback from the radios . . .

"When my seat fired, the plane was right-side-up and I went straight up into the water. Coming up I could see the hull of the ship. I was underneath the catwalk. I don't know whether I struck the side of the ship or not. If I didn't I came awfully close. I appeared to separate evenly from the seat in a normal fashion and was flung into the water." *(The accident report states that observers saw the bottom of the seat hit the*

As the aircraft, held by the barricade, hangs from the side of the ship, the RIO prepares to complete his egress.

undersurface of the angle deck and that the pilot entered the water strapped in the seat although he believes he did not. Medical personnel theorized that the pilot's compression fracture of his left leg just above the ankle was caused by his left foot striking the undersurface of the deck.)

A crewman from the rescue helicopter hooked the hoist cable to the pilot's torso harness lift ring. As the pilot and helicopter crewman were being lifted out of the water, the pilot's drogue parachute deployed and billowed. The hoist operator lowered them back into the water and the pilot's chute was detached. They were hoisted a second time without difficulty except that the pilot's seat pan gave the crew a "hard time getting the

pilot into the cabin." The rest of the rescue operation went smoothly without complications.

RIO's Experiences

Events developed in a different pattern for the RIO. "In retrospect, my primary concern was not with the possibility of the aircraft's going off the flight deck once the engagement had been accomplished," he reports, "but rather with the possibility of fire upon landing in the configuration we were in. With that in mind, I attempted to prepare myself for the engagement and egress that would follow. I removed both leg restraints and unfastened the left side rocket jet fitting that forms the lap restraint. *(This was a dangerous procedure. OpNav Inst. 3750.7D, General NATOPS, requires that safety belt and shoulder harness be worn and tightened prior to takeoff and, except when necessary activities require temporary removal, shall be continued in use until the completion of the flight.)* I was confident that I could unfasten the two koch fittings and the remaining rocket jet fitting in a minimum amount of time and thus egress from the aircraft without use of the emergency harness release and the bulk of parachute/seat pan that this would entail.

"Once it was apparent that the aircraft would not remain on the flight deck, I attempted ejection by means of the seat pan firing handle. The canopy left the aircraft as advertised but the seat failed to fire. I'm fully convinced that I pulled the handle far enough to effect an ejection – it appeared that it was out approximately 10 to 12 inches. *(Since the seat was not recovered, no reason for its failure to fire can be established.)*

"The aircraft was securely held by the barricade although the nose and fuselage were submerged up to the wings. I removed the koch fittings, rocket jet fitting, anti-G suit hose and oxygen/radio hose and then climbed up onto the canopy rails. I took my oxygen mask and gloves off and discarded them. I tightened the strap of my helmet and dove over the port side of the aircraft.

"Once in the water, I waited until the initial turbulence had subsided and then inflated my Mk-3C life preserver. I used two day-smoke flares to indicate position and wind direction for the rescue helo. Pick-up was normal in all respects. I would estimate the time from entering the water until the return to the flight deck was no more than 10 minutes. All the flight gear and rescue equipment performed as expected with no resulting injuries on my part."

Important Survival Lessons

This account illustrates several important survival lessons:

- Detaching the parachute before helicopter hoist is vital to the safety of both the survivor and the helicopter crew. A billowing parachute is a danger to all concerned.
- It is essential to have restraint systems securely fastened for a barricade engagement.
- Training and conditioning pay off, as in this instance, when split-second decisions and action must be taken to survive. And training and teamwork produce a smoothly functioning SAR helicopter crew.

Barricade Engagement

After extensive study of the failure of the barricade to safely arrest the aircraft, investigators concluded that the barricade itself performed in a satisfactory manner. Had the aircraft remained approximately centered it would have been satisfactorily arrested. The investigators concluded that the engagement of the No. 3 CDP prior to the barricade was the largest contributing factor in causing the aircraft to swerve to the left of centerline and subsequently go over the side. They felt that "the catastrophic results of this arrestment, despite full compliance with published bulletins and the absence of any perceptible personnel factor indicates that the recommended recovery procedures are not adequate under the specific conditions experienced in this accident." In addition to recommending an immediate one-time visual inspection of all AFC 230 Part III main landing gear piston and fork assemblies and a NavAirSysCom investigation of the design adequacy of AFC 230 Part III, the investigators' final report recommended that the aircraft recovery bulletin for F-4B barricade engagements be revised to indicate removal of all wires aft of the barricade when the aircraft configuration is one stub main gear and both other gear down.

The fifth endorser noted that the present cross deck pendant removal criteria are established by Aircraft Recovery Bulletin 12-12 and that there is conflict between this bulletin and certain NATOPS publications. At the time of the endorsement CNO had set up a conference for review of this bulletin and NATOPS procedures which was about to convene. The results, the endorser stated, should provide for standardization in NATOPS and Recovery Bulletins and resolve differences in the recovery procedures for aircraft with damaged landing gear.

Safety Center comment: In July 1968 a meeting was conducted in which Aircraft Recovery Bulletin 12-12 and Aircraft NATOPS conflicts were resolved. ARB 12-12A was subsequently published and indicates removal of all CDPs or CDPs aft of the barricade, as appropriate to the particular ship, should be accomplished, time permitting, prior to barricade arrestment of an F-4 with a stub MLG. Individual NATOPS Manuals are being changed to conform with ARB 12-12A which is the governing instruction for shipboard arresting gear personnel. ◄

notes from

Helo Lift Ring

DURING an overwater rescue in which the SAR helicopter was under fire from the beach, a survivor had the rescue hook in hand and was attempting to attach to it. He searched for his D-ring on his left shoulder but the ring was in its proper place on his right shoulder. Unable to find the D-ring, he gripped the hoist ring above the hook and signalled the helo crewman to bring him up. The crewman considered this too dangerous and sent a trained swimmer into the water. The swimmer checked the survivor over, made sure he was free of parachute and seat pan, hooked up, and on signal, both men were hoisted aboard.

Clothing and Survival Equipment Change 4 of 28 Feb 64, Helicopter Lift Ring on MA-1, MA-2 and MA-2P Parachute Harness: installation of, refers. The movie, "Parachute Release and Rescue," MN-10125, color, 16 minutes, includes a sequence of the lift ring in use.

Be Equipment Wise

A REVIEW of A-7 ejections through calendar year 1968 shows that four of the 28 pilots who ejected lost their helmets. All four losses were reported as due to loose chin straps.

We don't mean to single out A-7 types as prime offenders. No doubt many of their brethren throughout the fleet neglect this little item. But these findings illustrate the point that pilots and aircrewmen *must* be prepared, equipment-wise, at all times for emergency egress – be it bailout, ejection or ditching.

In many circumstances there just is not enough time to take care of such a detail as tightening your helmet chin strap when it's time to go.

Cuts Through

IN AN F-4B ejection, the NFO's right safety shoe was cut completely through the leather 2 inches from the toe. The metal toe prevented serious injury. All other safety and survival equipment also functioned in an excellent manner, the report states.

Unscheduled Dip

THE FACT that the three-man crew of a UH-1E which crashed on a local training mission had life vests on facilitated their rescue. Although the aircraft went in close to a built-up area, the SAR helo was unable to retrieve the crew from land because of the dense undergrowth and 50 to 60 ft tall trees. The survivors inflated their life vests and floated and paddled to the center of a creek where they were hoisted aboard.

SAR helo pilot's comment: "This accident emphasizes the need for mae west and signal/survival equipment on *all* flights."

Sea Anchor

NEITHER the pilot nor the RIO who ejected from an F-4B overwater was aware that his PK-2 life raft had a sea anchor. Both men had some difficulty keeping their rafts pointed into the wind.

Normally, the sea anchor on the PK-2 raft is in an outside pocket on the bow. (Air Crew System Change 55 of 1 Nov 65 refers.)

Windscreen Shatters

AT 9000 ft, 300 kts, during an instrument climbout the left-hand windscreen of a TF-9J shattered. Fatigue failure was suspected. The aircraft was subsequently landed without further damage.

"It is continuously stressed during safety lectures and all pilots meetings that pilots wear proper and complete flight gear," the squadron C.O. reported. "The fact that both pilots involved in this incident were flying with their visors down prevented any injury to themselves due to wind blast and flying plexiglass."

Gloved

SAFETY council minutes from a CVA report that in a recent ejection the pilot was engulfed in flames and would have had severe burns if he had not been wearing gloves. One glove was charred and burned but his hand was uninjured.

Lack of Lanyards

WHEN a SAR helo arrived on the scene, an F-8 pilot who had ejected left his raft and, with some difficulty, swam to the rescue seat. He climbed onto the seat and then discovered that he still had his seat pan kit and raft attached. A crewman from the helo jumped into the water and cut the survivor

your flight surgeon

free of his seat pan lanyard. Both men were hoisted aboard.

The pilot had forgotten to release his seat pan rocket jet fasteners. He said he would have cut the lanyard but had lost his shroud cutter out of his survival vest on ejection. He also lost his .38 cal. pistol. Both pistol and hook blade knife were carried in the same pocket.

All pilots in the squadron have been instructed to make sure that their survival gear is securely attached to their person.

Air Crew Systems Bulletin 157 Survival Equipment Vest Type SV-2, refers: "The pistol is secured to the vest by a lanyard line (Type I suspension line Mil-C-4030) by means of a bowline knot. Tie the lanyard line through the trigger guard of the revolver or to the lanyard loop on the butt of the automatic .... The knife is stowed in the pocket provided on the right side of the vest with the hook in the open position, hook down. The securing lanyard (36 inch cut length of Type I Mil-C-5040 suspension line) is tied to the knife securing loop and the grommet provided on the right shoulder strap using a bowline knot."

Rocket Burns

AN F-4B pilot who ejected after a midair collision sustained second degree burns on his left hand from firing of the rocket seat. His burns, the investigating flight surgeon reported, were a direct result of his failure to wear gloves.

Great Aid

THE WATER entry and survival phase after ejection and also the helo rescue went very smoothly. I attribute this to training. Prior to each evolution, I rehearsed the procedures in my mind. We have had numerous lectures and demonstrations on survival equipment and procedures. Additionally, I attended TAC Deep Sea Survival School at Langley Air Force Base in 1965. The procedures for survival in a raft and helo rescue learned there were a great aid.

F-4B pilot after rescue

If Somebody Asked

IF SOMEBODY asked you to estimate how many instances of improper use of personal survival equipment or absence of such equipment are reported to the Safety Center in a year, what would be your answer? Well, in a recent survey made of Aircraft Accident Reports for Fiscal Year 1968, the total was 457.

Personal survival equipment and procedures are the personal responsibility of pilots and aircrewmen.

- It is unwise to leave your survival equipment behind in your locker when you go flying.
- It is unwise to "rest your eyes" or let your mind wander during a survival equipment lecture-demonstration.
- It is unwise to let your aviation physiology training expire.

Squadron training and physiology training unit programs are important but when the chips are down, the squadron survival and equipment people and the physiologists won't be around to show and tell. You'll be on your own and your own survival will be up to you.

HELICOPTERS have proven their worth time and time again but there is always a different use that the chopper can be put to. This one concerns

Underwater Tow

Being towed . . . . .

EVERYONE knows how helicopters, carrying heavy loads, can perform jobs that either would not get done or, when done another way, would take much more time to accomplish. This story concerns the operations involved in using a helo for towing. The operation progressed famously for a while then got out of hand in a hurry. This is how it happened in the words of the pilot.

Towing

"We departed in an RH-3A for the purpose of checking the underwater trim of a new device. Preflight, takeoff and streaming were normal. We commenced towing . . . with 1600 lbs draw bar tension. The device towed smoothly at 1600 lbs, so tension was increased to 1800. A 180-degree turn was made to a heading . . . downwind. At completion of the turn tension was increased to 2000 lbs. We were operating on the tow-bar coupler and it had been holding very nicely.

"Shortly after retrimming for the new heading and tension, I noticed the tension had increased to 2200 lbs. I beeped in some aft cyclic to correct the tension back to 2000 lbs. At this time I felt the tension decrease to zero (the device had broached), the nose pitched up, and the helo ballooned to 80 ft.

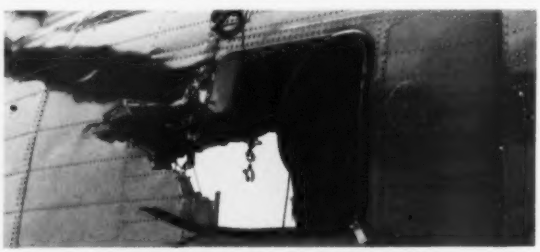
"Before the device broached, tension was 2000 lbs, altitude was 45 ft, and doppler speed indicated 25 kts. As tension returned a loud bang was heard and heavy

. . . . . to the beach.

Easy does it.

vibration started. The aircraft began oscillating about the longitudinal and horizontal axes. The ASE control panel tore loose from the console and one of its advisory light capsules popped off.

"Control feedback in cyclic, collective and yaw was very severe and I was having difficulty keeping the helo level. I yelled at the copilot to secure the engines but he


Slight damage.

couldn't hear me as I still couldn't reach the microphone switch. I wedged the collective down with my knee and grabbed for the speed selector handles. I got No. 1 back to idle cutoff but No. 2 slipped out of my hand and did not go around the detent. The copilot then shoved No. 2 back up. I yelled at him again and he said something about tipping over. I told him to blow the flotation bags and secure the engine but he still couldn't hear me. I managed to shift my hand on the cyclic to reach the microphone button and repeated the order. I blew the flotation bags and he secured the No. 2 engine, both firewall fuel shutoffs and the electrical system. The rotors were allowed to coast down without applying any rotor brake.

"I unstrapped and got out of my seat to see if everyone was all right and to assess the damage. The copilot stayed in his seat and turned on the battery switch in an attempt to contact someone on the ARC-39. He was unsuccessful due to the fact that the antenna had been torn loose. I saw that four tail rotor blades had sheared off about a foot from their tips and the fifth blade was broken in about the same place."

This helo was not lost at sea. It stayed afloat – upright – and was towed safely to the beach by boat. Overhaul restored it to service. It was concluded that the device broached, whipped the cable into the tail rotor causing subsequent oscillations which resulted in the forced landing. The pilot was commended for saving the helo. Such operations are fraught with unknowns and should only be conducted with great care by an experienced crew like this one.

Towing operations by this squadron was routine and you can bet these pilots were as well prepared for this happening as any could be. So if you are tempted to try something unusual or different with helicopters, leave the execution to those who are charged with the responsibility to conduct experiments.

Towline did this.

EVER READY

IF you knew when you were going to be involved in an accident you would simply not aviate that day. (Think what a fantastic safety record we would have.) However, since we are not omniscient it takes lots of training and practice to cope with an emergency when it arises.

This story is about an emergency and it unfolds aboard a big attack carrier in the Tonkin Gulf. A pilot and RIO of an F-4B are just entering the readyroom. These gents had flown together often and knew each other's capabilities. This day they were scheduled for an early afternoon launch. The Ops officer noted with pleasure that this team was ready.

Shortly after the briefing, "man aircraft" was announced. They quickly manned their plane. After a complete walk around and no discrepancies noted, this crew strapped in and awaited their turn on the catapult. These "pros" on various occasions, while in the ready room or at other times, had often discussed their emergency procedures. They played a kind of game. It always started with, "OK, what would you do if . . ." As pilots, RIOs, BNs, controllers and all flight crews are wont to do, they had many times discussed what they would do if they got a cat shot which provided insufficient end speed, or if the bridle broke during the launch. They were ready.

The pilot checked with his RIO and gave the signal they were ready to go. The catapult officer gave the signal and off they went. The pilot got the gear up and tried to start a turn. Instead he got a sickening feeling. He couldn't move the controls. The F-4B would not respond. He told the RIO to punch out and as he spoke the RIO was gone. The pilot tried again, this time with both hands, to move the controls. No use, they were frozen. The pilot followed the RIO out.

The training, the practice, the mulling over paid off. Everything worked as advertised. The "angel" was on the scene immediately and both the pilot and RIO were back aboard in six minutes. Talk it up among yourselves, gents – it pays!

Effective Management Ca

This we know – aircraft and engines are much more complex now than they were years ago. We have heard this statement made many times, but what about our maintenance techniques? Are they keeping pace with the latest improvements in the hardware? We would like to be able to say, "Yes they are," but being practical and realistic we know our shortcomings in the maintenance area; the statistics are only too real.

We would *like* to say that the equipment and hardware are to blame; that it is not adequate, that it

was
subj
stat
own
we
quic
argu
least
W
stud
inte
prog
with
char
used
year
nece
a re
trai
hand
M
prog
satis
relia
meet
educ
and
equi
W
of th
to th
the
mear
subo
other
contr
lettin
Th
direc
main
one
their
Le
conti
comm
of m
persis
practi
only

nt Can Reduce Maintenance Error

was not designed to withstand the operational strain it is subjected to – but can we? Maybe part of that statement is true, but first we must look carefully at our own procedures. What about our training program? Do we have enough qualified people to do the job? Our quick reply might be, "No," but it would be open to argument. By and large, we must recognize we have at least as many as we are likely to get in the near future.

What then is the problem? The first area we might study in an attempt to find the answer is our intermediate and organizational maintenance training program. There should be a formal program in effect with qualified instructors, training aids such as flip charts, films – the whole works. Lesson guides should be used so our material can be kept up to date. Over the years it has been proven that in order to accomplish the necessary training to meet the needs, it must be done on a regularly scheduled basis, not piecemeal. A good training program and an accident-free record go hand-in-hand.

Much can be said about the curriculum of such a program. The maintenance officer must be able to satisfy his commanding officer that he can provide safe, reliable aircraft to meet operational commitments. To meet these requirements takes men who are well educated, trained, and motivated to accomplish the task, and *that* requires effective management of personnel and equipment.

What is *effective management?* From the viewpoint of the aircraft maintenance officer, an in-depth answer to this question may become quite complicated, but in the finale, effective management simply means – *running* your department. Running it through subordinate supervisors, with good relationship with other departments, by monitoring, creating, and controlling maintenance functions, as opposed to just letting them happen.

There are relatively few factors which will have so direct an effect on the overall performance of an aircraft maintenance department as having a "boss," a real boss; one that knows his job, knows his subordinates, and their jobs. This is the basis for effective management.

Let's take a look at "maintenance error." This phrase continues to haunt all levels of the aircraft maintenance community. A careful and objective analysis of reports of maintenance errors, produces two disturbing and persistent cause factors. First, deviation from accepted practices, and second, lack of supervision. There can be only one way by which these two factors will be recognized and corrected; effective management. What are some other effective management problems?

- Shortage of personnel to train.

- Initial technical training is limited., due to training facilities accomodation of personnel.

- Follow-on training is limited and at times is precluded by tempo of operations.

- Deficiencies in technical publications particularly technical directives.

- Complicated by complex hardware assemblies.

All of these things can lead to potential maintenance error and, continuing to be realistic, they are problems that must be dealt with every day. There is no quick solution to them on any level.

Should we continue to live with our problems as we have been doing in the past? To some extent we must, as we are not going to be able to get new hardware overnight, even though the hardware deficiencies are recognized. It takes lead-time to procure parts even when the funds are available. But, for the most part, we do have the people and we can certainly teach them what to look out for when they conduct their inspections since we as maintenance officers may have already learned – often the hard way. We can't afford to wait until we have lost an aircraft or have had an engine come apart at high power turnup to say, "They should have known better," or that, "I just submitted a UR on that malfunction last week and nobody has done anything about it yet." We must evaluate our program on a continuing basis to see just how effective it is.

It is hard for us to realize, especially when we may be at the bottom of the ladder, why it takes so long to get anything accomplished. Let's ask ourselves, do we report our deficiencies promptly, completely, and accurately? It may take days or weeks for it to get up through the chain of command to the man who can take the action. This is why it is so important that the originator of the report identify the urgency of the problem so that the proper type report can be used, and expeditious action insured.

The time to act is now. Don't stand by and allow maintenance errors which you have the capability to eliminate. ◄

Lateral Control Problems in F-9 Series Aircraft

CONTAMINATION of hydraulic fluids pose a hazard to the safe operation of today's aircraft. Bits of rubber, sand, metal shavings, aluminum or bronze chips, hunks of filings and other junk are unwelcome visitors in the hydraulics system of any aircraft.

Recently, a number of such hydraulic contamination problems have manifested themselves in F-9 series aircraft. The lateral control system has been primarily affected, although there has been at least one incident involving a landing gear malfunction. The following incidents are typical of the problems which have been encountered in the F-9:

- During the landing approach at about 25-40 ft of altitude the aircraft inadvertently started to roll right with no response to left stick movement. The pilot secured the yaw damper (it had been previously griped) but there was still no response to the stick movements. Full power and left rudder was applied to pick up the right wing and establish a climb. At 550 ft there was still no response to the stick and the pilot observed normal operation of the starboard flaperon but the port flaperon remained down. The pilot switched to flaperettes and landed without further incident. Prior to shutdown he switched back to flaperons and the port flaperon still would not raise. Later attempts by maintenance personnel to duplicate the discrepancy were unsuccessful.

- The pilot reported sluggish response to the flaperon system. The stick required more than the average displacement and pressure to attain a moderate rate of roll.

- The pilot was in a left turn after takeoff. The aircraft continued rolling left and could not be controlled with the stick. The roll was stopped with rudder and control was regained by selection of flaperettes. Ground checks of the flaperons after landing revealed the port flaperon was sticking up slightly at times.

- After 35 minutes of a tactics training flight, the student tried to reverse a port wing down turn when the starboard flaperon failed in the flush position. Several

cycles of full stick deflection failed to raise the flaperon. The student pilot selected flaperettes and made an uneventful landing. After landing, flaperons were reselected and the flaperon still would not move. Investigation revealed that the starboard flaperon slide valve was frozen in the full down position.

Investigation of Incidents

These incidents have been closely studied at all levels in an effort to determine the causative factors. As a part of the investigation, CNATra established a requirement for the collection and analysis of hydraulic fluid samples from any F-9 aircraft involved in a control system malfunction and established a field engineering assistance team to provide assistance to operating units.

Information obtained during this investigation indicated that the primary problem in the F-9 lateral control malfunctions was hydraulic fluid and component contamination with a secondary factor being misrigging.

F-9 IAFB No. 51 Rev A (NavAirReworkFac Pncla msg 141704Z of June 1968) was issued to require a one-time inspection of the F-9 lateral control system in accordance with NavAirReworkFac Pncla Engineering Report 7-68. This IAFB also indicated that the Maintenance Instruction Manual, NavAir 01-85FGF-2-13 Rev 15 Jul 1960, would be changed to reflect the information contained in the cited report and to require rerigging of the lateral control system whenever any lateral control component is replaced during routine maintenance.

F-9 IAFB No. 54 (NavAirReworkFac Pncla msg 022216Z of Oct 1968) and Amendment 1 (NavAirReworkFac msg 062213Z of Dec 1968) were also issued. This bulletin (and amendment) provided procedures for hydraulically flushing contaminated lateral control systems as soon as possible but not later than the next calendar inspection. Detailed instructions for this task are contained in NavAirReworkFac Pncla Engineering Report No. 13-68. This report amplified the instructions which are now contained in the Maintenance Instruction Manual, NavAir 01-85FGF-2-3.

In addition to these actions, NavAirReworkFac Pncla msg 221816Z of Oct 1968 recommended all hydraulic jennys used in F-9 maintenance be flushed and cleaned as soon as possible utilizing the following procedure:

- Drain tank and piping.
- Remove old filter elements and replace with new filter elements.
- Fill tank with P-D-680 (Stoddard) dry cleaning solvent and flush by recirculating solvent through the system for 15 minutes.
- Drain and refill with Mil-H-5606B hydraulic fluid (about 10 gallons), flush for five minutes to remove traces of solvent and drain.
- Replace filter elements, fill completely with new hydraulic fluid and return jenny to service.
- If possible clean hydraulic jennys inside a well ventilated area and observe normal fire prevention precautions as P-D-680 cleaning solvent is flammable.
- Forward samples of hydraulic fluid taken before and after cleaning each jenny to NavAirReworkFac Pncla.

Hydraulic Contamination Not Peculiar to F-9

Although hydraulic contamination problems in the F-9 have been discussed at length, such problems are not peculiar to any one series aircraft. Contamination is a hazard to the smooth operation of hydraulic systems in any aircraft. The importance of maintaining a high level of cleanliness when working on hydraulic systems cannot be overemphasized. The high pressure and close tolerances require that the systems remain free from contamination. NavAirReworkFac Pncla Engineering Report No. 13-68 offers these precautions to prevent dirt from entering and contaminating hydraulic systems:

- Clean outside of fittings, including quick disconnects with dry, lint free cloth before separating. If fittings are located in dirty areas, clean area before cleaning fittings.
- When lines and components are disconnected, cap tube ends and ports and mask exposed surfaces such as piston rods to prevent damage. If suitable protection cannot be achieved with caps and plugs, place vinyl plastic bags over open ends of fittings and secure with pressure sensitive tape.
- Maintain reasonably clean and dry tools and hands when working on hydraulic systems and components.

Hazards of Radioluminescent Materials!

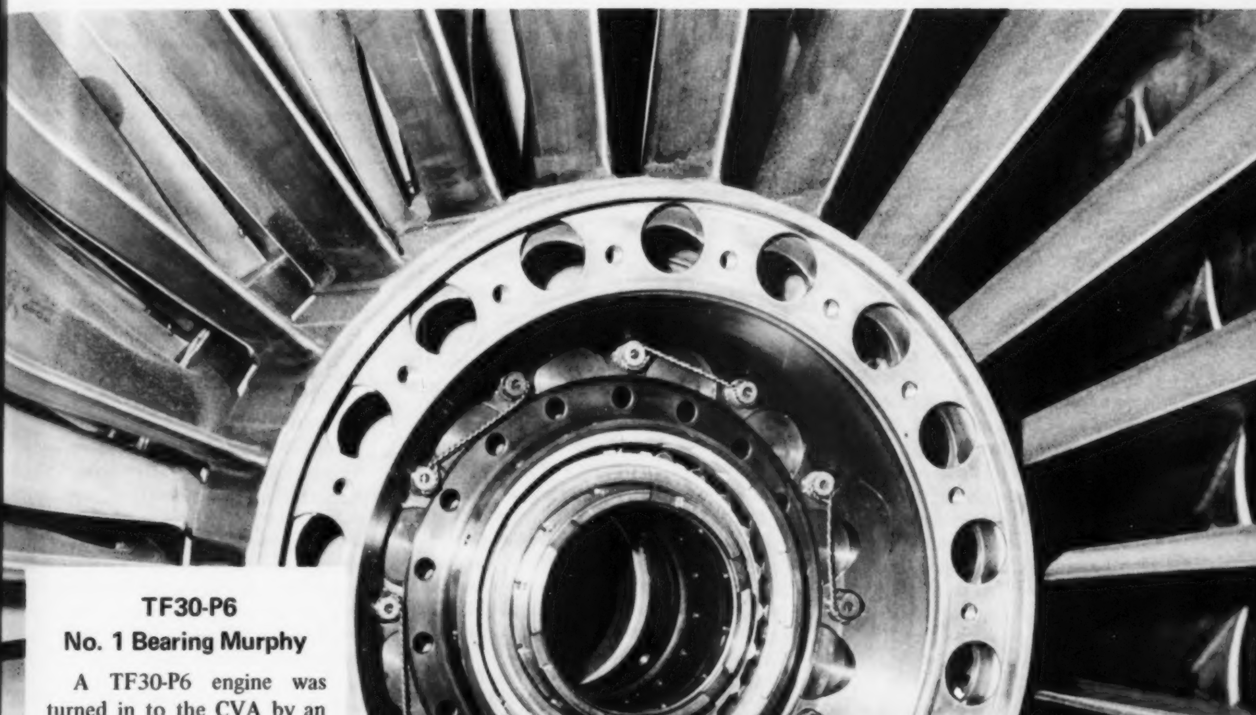
SOME clocks, compasses, wristwatches and other items which contain radioluminescent materials constitute a potential health hazard due to the presence of radioactive material contained within the device.

Formerly, many instruments contained the very hazardous isotopes of radium-26 and strontium-90 but more recently the trend has been to use non-radioactive luminous compounds or the less hazardous types of radioactive isotopes. In any event, damaged or deteriorated radioluminscent material or devices containing radioluminescent material may contaminate local areas with radioactive particles which can be picked up on the hands and clothing of personnel. These conditions could lead to the ingestion or inhalation of radioactive particles which would be hazardous to health.

NavElex Instruction 5100.1 provides general guidelines to all ships and stations for the safe handling of radioluminescent materials; NavElex Instruction 5100.2 (not to all) specifies the control procedures to be followed by commands having repair facilities working, or likely to work, on radioluminescent materials. Both these instructions should be strictly adhered to by the activities concerned and it should be noted that the latter instruction specifies a requirement for instrumental monitoring of materials, surfaces and personnel at certain activities. Those activities concerned which do not have capabilities for monitoring and surveillance should seek the advice of units which do. Many activities have a qualified industrial hygienist, health physicist or radiation control engineer/monitor who is qualified to perform such services.

In addition to the references already cited, NavMed P-5055, Radiation Health Protection Manual, should be consulted for additional information on radiation protection measures. ◄

MURPHY'S LAW *



TF30-P6
No. 1 Bearing Murphy

A TF30-P6 engine was turned in to the CVA by an embarked attack squadron because of FOD. Subsequent inspection of the engine revealed that the No. 1 bearing was installed backwards and had apparently operated in this manner for a total of 143 hours.

To preclude future Murphys of this type, it is recommended that the bearing installation instructions contained in subparagraph b, paragraph 7-30, page 7-13 of NavAir 02B-10FA-6-1, be followed precisely. This picture shows the No. 1 bearing *correctly* installed.

*** If an aircraft part can be installed incorrectly, someone will install it that way!**

Letters

Combined Services

Ottawa, Ontario – Your Nov 1968 issue carried an excellent article on dental problems at altitude. It's an excellent discussion of a perennial flight safety problem. We would appreciate your permission to reprint this article in "*Flight Comment*" magazine.

This and other excellent material makes your magazine just about the top-notch flight safety magazine around.

CAPT J. T. Richards
Editor, *Flight Comment*

• APPROACH is pleased to extend to "*Flight Comment*" permission to reprint "Dental Problems at Altitude" which appeared in the November 1968 issue.

We are grateful to have the opportunity to assist you and appreciate your interest and comments regarding APPROACH.

Clarification

FPO New York – I would like to clarify the statement attributed to me in the lead article, "Carrier Landings," appearing in the December 1968 APPROACH.

This information was obtained from a combined NASA/Navy study under the direction of Doctors Jones, Roman, Austin and Lewis. Several fine articles regarding the techniques used and data obtained have appeared in "*Aerospace Medicine.*"

I have used their data in teaching cardiology to the student naval flight surgeons, but lay no claim to the discovery of this interesting relationship.

Their work is unique in this field and they deserve the full credit for the findings.

CDR Hugh S. Pratt, MC
Medical Officer
USS SARATOGA

• Thank you, Doctor Pratt, for your letter. We are happy to have you clarify the origin of the statement. For readers who may not have ready reference to the December APPROACH, the statement referred to read as follows: "The hearts of naval aviators beat faster when they are coming in for a landing on the deck of a carrier than when they are engaged in combat with the enemy."

A-6 Manual Seat Separation

Norfolk, Va. – I read with great interest an article in your December edition of APPROACH entitled "Dark Rescue" which recounts the experiences of the crew of an A-6A *Intruder* who were obliged to make use of their ejection seats following a mid-air collision with an F-8. There were many areas of the narrative which revealed that the post ejection techniques of both crewmembers were not all they might have been but one sentence especially concerned me, even more so because the error was not mentioned in the editor's notes.

After ejection the B/N found that he was tumbling and then stabilized in a face down attitude. He then says, "Estimating my altitude as 11,000 ft., I manually pulled the rip cord – the parachute deployed normally accompanied by proper seat separation." This manual separation technique is not the recommended procedure and could result in a parachute entanglement that might cost the ejectee his life.

First of all let me say that a failure of the automatics on any Martin-Baker seat is an extremely rare occurrence but in a collision situation, where the chance of seat damage is high, failure of the automatics does become a possibility. Judging one's height above water at night is extremely difficult, if not impossible, especially after the disquieting experience of ejection following a mid-air collision. Although I would never presume to disagree with the decisions of a "user" who has been under these extreme conditions, I would suggest that any prospective ejectee wait until he is definitely below automatic parachute opening height, say in the region of 5000 – 8000 ft, before going manual. Obviously an ejection seat is designed primarily for automatic operation and once the ejectee opts to go manual he is using a less efficient back-up system. So always give the seat every chance to operate automatically if possible.

Having decided to go manual one does not follow the procedures adopted

by the B/N in the subject article. The correct procedure to manually deploy the parachute is as follows:

1) Grasp the manual override handle and pull it up and back HARD, thereby disconnecting the harness and leg restraint locks.

2) Place the hands on the sides of the seat bucket and pitch forward and downward as hard as possible, getting one's head as close to the knees as possible. This pitching forward action aided by the push of the hands, will provide the smoothest seat/man separation obtainable. If performed as a forceable forward pitch, no difficulty will be encountered.

3) Having cleared the seat, grasp the parachute ripcord handle and pull it down and across the chest, hard.

Having adopted these correct separation and parachute manual deployment techniques, the ejectee will find himself suspended on his parachute and he can then set about preparing for his landing, using the same procedures as for the automatic case.

I should like to add an "Amen" to the Accident Report endorsement that there is no substitute for knowing one's escape procedures under all conceivable conditions. With fully automatic ejection seats the manufacturers are doing their utmost to make the pilot's escape as simple and reliable as possible but the aircrews must still play their part in their own survival and it is to be hoped that they know how to play it right.

Brian Miller
Martin-Baker, Technical Representative
Atlantic Fleet

• Thank you for your letter. An editor's note addressing the topic of manual seat separation would seem to have been in order. It should be pointed out that Step 2 in the above letter is, at this writing, a proposed NATOPS change. The A-6 conference has included this in the next revision to the A-6 NATOPS Manual. We agree that the automatics should be given every chance to perform. The anxiety generated by a night ejection over water, or cloud cover obscuring the surface, may encourage some pilots to override the automatic sequence. If you can't see the surface, you can't judge the altitude. In a situation like this the best method of altitude determination would be a good look at the altimeter prior to ejection, when possible, so that you'll have some idea of your relation to normal seat separation altitude.

Moral Support

Parkesburg, Pennsylvania – Our company manufactures "pencil flare guns" and cartridges for military use . . . literally by the millions.

An important part of my job is to keep our manufacturing personnel constantly aware of the importance of the job they are doing. Lives depend on their doing their very best work every day.

In the December 1968 issue of APPROACH is an article entitled "Dark Rescue" which graphically describes how a flyer's life may depend on his survival equipment. I would like to receive your permission to reprint this article in its entirety for distribution to our people. Your article gives a first hand account of an actual rescue and would be far more impressive than anything else in stimulating a sense of responsibility among the workers.

J. David Narbeth
Director of Public Relations
Penguin Industries, Inc.

• Permission granted! We hope your manufacturing personnel will recognize the significance of their fine work and thank you for your interest in ours.

ASO's Corner

NAS Pax River – There are still some ASO's around who have not been to USC or Monterey and there are many of us who have, who are always looking for new ways to promote safety. In APPROACH you have continuing departments such as "Maintenance Notes" and "Flight Surgeon's Notes" that contain short items on related safety topics. Also, articles such as "Answers from Aggie," written by experts in the field, appear from time to time. Many topics of interest to the squadron ASO, not worthy or lengthy enough to warrant the full blown story treatment, could very readily fit into such a department. A few that come quickly to mind are accident investigation techniques, tips on writing a good pre-accident plan, and ways of maintaining an effective safety program.

I think it would be beneficial to us struggling ASO's to have these ideas and suggestions collected into a permanent feature in APPROACH, entitled perhaps, "ASO Notes."

Here's to lowering the rate.

C. H. Monroe
ASO
VX-8

• We are on the same frequency. Your idea on an "ASO Notes" feature similar to "Flight Surgeons Notes" is under consideration.

In the past, a compendium of quarterly aviation safety council meeting notes was run as a sort of howgozit in the fleet. It had various titles, MONITOR, FLIGHT NOTES, but was never a success as far as audience appeal vis a vis letters to the editor expressing its effectiveness.

Our staff is presently kicking around a feature based on the input from safety councils fleet-wide. This appears to be our most fertile source. At this time we have no title for the series or even a date for the first printing but it will probably be in the spring and be a department like "Flight Surgeon's Notes" and "Maintenance Notes and Comments."

Wind Chill Chart

APO Seattle – As a member of the Alaskan Air Command and NCOIC of Quality Control I am always interested in articles on cold weather. Your wind chill chart in the September 1968 APPROACH caught my eye immediately. The information you have and the information we use is quite different. Enclosed is a chart derived from the Arctic Aeromedical Laboratory Report 64-28 which is 10 years later than the Army wind chill chart of November 1954. I hope this chart will be of some use to you.

CMSgt Edward A. Dahl, USAF
NCOIC, Quality Control Branch
21 Comp WG, Alaskan Air Command

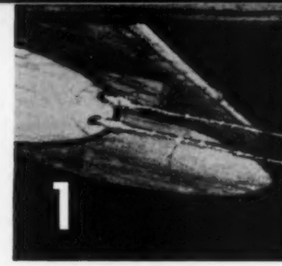
• By now you most likely have seen the December 1968 issue of APPROACH in which the current wind chill chart from TB MED 81 of 20 Oct 64, jointly issued by the Department of the Army, Navy and Air Force, appeared. The structure of the chart you sent and the chart in TB MED 81 is the same and the equivalent chill temperatures are in general agreement.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.

Address: APPROACH Editor, Naval Safety Center, NAS Norfolk, Va. 23511. Views expressed are those of the writers and do not imply endorsement by the Naval Safety Center.

Vol. 14 **approach** No. 8

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

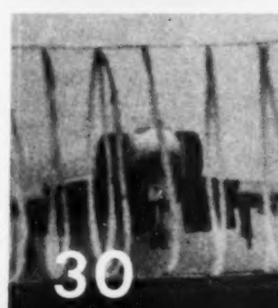


CONTENTS

1 Aerial Combat Maneuvers
10 Behind the Stratus Layer
13 Plenty of Time
14 Unauthorized Maneuvers
18 Backside of the Power Curve
21 Taxi Troubles
24 Found: A Needle in a Haystack
26 Red Light Blindness
28 Rope and Hoist
30 A Bit Unusual
36 Underwater Towing
39 Every Ready
40 Effective Management
42 Lateral Control Problems in the F-9
44 Hazards of Radioluminescent Materials

DEPARTMENTS

8 Short Snorts
17 Great Aviators I Have Known
22 On the Glide Slope
34 Flight Surgeon's Notes
45 Murphy's Law
46 Letters
IBC Lift and Drag



NavWeps 00-75-510

Purposes and policies: Approach, published monthly by the Naval Safety Center, presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders or directives and may not be construed as incriminating under Art. 31, UCMJ.

Photos: Official Navy or as credited. Non-naval activities are requested to contact NavSafeCen prior to reprinting APPROACH material.

Correspondence: Contributions are welcome. The right to make editorial changes to improve the material without altering the intended meaning is reserved. Reference to commercial products does not imply Navy endorsement. Views of guest-written articles are not necessarily those of NavSafeCen.

Distribution: Requests for distribution changes should be directed to NavSafeCen, NAS, Norfolk, Va. 23511. Phone: Area Code 703, 444-4279, Att: Safety Education Dept., IF YOU ARE A PAID SUBSCRIBER, address all renewals and address changes to Division of Public Documents, Washington, D. C. 20402.

Subscriptions: Single copy 60 cents; 1-year subscriptions $7.00; $1.75 additional annually for foreign mailing.

Printing: Issuance of this periodical approved in accordance with Department of the Navy Publications and Printing Regulations, NAVEXOS P-35. Library of Congress Catalog No. 57-60020.

Next Month

A penetrating look at trends in the aircraft accident rate.

RADM Roger W. Mehle, Commander, Naval Safety Center

CDR C. F. Clark, Editor
LT W. T. T. Hood Jr., Managing Editor
Robert Trotter, Art Director
J. C. Kiriluk, Maintenance Editor
J. A. Bristow, Life Sciences Editor
W. E. Cumbie, Military Editor
C. B. Weisiger, Helicopter Editor
Blake Rader, Illustrator
PHC Harry Culbertson, Photographer

CREDITS **Cover Painting** by Howard Boyle shows the CH-46 performing one of its many significant missions in Vietnam. Courtesy Boeing Co. (Vertol Division) Philadelphia, Penna. **IFC** Drawing courtesy Hughes Aircraft Corp. **Pg 5-6** Photos from the collection of CDR C. A. Brown. **Pg 24** Main photo: Art Schoeni, courtesy LTV. **IBC** Photo: PHAN D. A. Wilding, VP-21.

Wish I Had Said That. . .

"Within the next few weeks, several Naval Air Reserve Training Command activities will be receiving updated ASW aircraft. Inherent with receipt of these new aircraft is transitional training. Flight crews, support personnel and maintenance men will necessarily devote a majority of their time to learning operating procedures, aircraft systems and tactical employment of these newer weapon systems.

"To effectively complete the transition to S-2E, SP-2H and/or SH-3A aircraft, accident free, extra precaution is prudent. Among those 'extras' that are a must are:

- Allow more time for daily inspections.
- Schedule extra time for briefings and preflights.
- Utilize wheels watch when practice landing periods are scheduled.
- Conduct training for personnel who will be involved in support functions such as towing and servicing.
- Instill in flight crews (the requirement) that the aircraft must be 100 percent ready for flight.

"Successful transition is dependent upon cooperation of all personnel involved. Knowledge acquired must be supplemented with experience but flight crews, support personnel and maintenance men should not be led to believe that experience will in some way transcend or replace knowledge. Aggressiveness in learning is encouraged but accidents caused by over-aggressiveness are not condoned."

CNAResTra Msg.